AVIATION

The Oldest American Aeronautical Magazine

SEPTEMBER, 1930

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A McGraw-Hill Publication

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The Oldest American Aeronautical Magazine

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AVIATION

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The Oldest American Aeronautical Magazine

EDWARD P WARNER, *Editor*

Volume . . . ***September, 1930*** . . . Number

RACING AND PRIVATE FLYING

THIS month we couple together for special emphasis two subjects not often discussed in parallel In various European countries, and particularly in Great Britain, the private pilot has found his way into the competitive arena as a matter of course In the United States piloting in contests has been almost entirely reserved for the professional.

There could be no more disastrous blunder than to think of air racing as of concern only to the full-time pilot The professional can find plenty of other things to occupy his time, but the amateur *must* be furnished with some definite element of sporting interest to keep him active. The gravest menace to private ownership is the man who learns to fly, and buys a plane, and then in a short time tries to dispose of it because flying around and around a field or from place to place over familiar country has palled on him and he cannot think up new forms of aerial entertainment For some people flying in itself is a sport, just as many find horseback riding quite sufficiently exciting without any such complications as steeple-chasing or polo, but the majority of private pilots need some definite purpose for their piloting. They need to learn that the airplane can be used as an instrument not merely as an end in itself There is no more effective means of accomplishing that than through getting them into competition with each other

In the King's Cup Race, Great Britain's aerial classic there were this year a number of starters who entered their own machines at their own expense and piloted them themselves men and women not even having any connection with the aircraft industry In all the national air races of the last three years together, the competitors rigorously falling in that non-commercial category could probably be numbered upon the fingers of one hand We have neglected to give our private pilots a competitive opportunity in proper form. So far as it *has* been given, they have neglected to avail themselves of it

They need not confine themselves to straight speed competitions, either straightaway or around a closed circuit Handicapped events increase the interest and uncertainty, and there are a variety of gymkhana competitions exciting and not particularly hazardous, designed to measure the qualities of the pilot and not the inherent performance capacity of his machine Flying meetings stressing contests of that sort can at once be a real test of flying ability and most amusing to competitors and spectators alike They need not be expensive for sportsmen who fly without thought of profit do not have to be dragged into a contest by the lure of a certified check The advantages of semi-informal meetings to bring pilots together are so obvious that the almost total failure to hold them up to the present time is inexplicable They have been suggested They have been urged by local and national organizations,—but except for some experiments by the Long Island Aviation Country Club the suggestions have taken themselves out in talk

Not merely because it naturally harmonizes with the theme of air racing do we devote so much attention to private flying at this time The development of purely non-commercial operation in the United States has,—we may as well face the fact,—been bitterly disappointing

The way in which the manufacturing industry has grown, and the form that it has taken, have been predicated largely upon a wide and rapidly growing popular acceptance of the private plane. If public interest is to be sparse and specialized, its growth lame and halting, the industry is going to need vigorous reorganization.

But we do not accept that as a necessity, nor even as a probability. Give the potential private owner the right kind of plane, give it to him under the right economic conditions, show him how to get the utmost use and pleasure out of it without undue trouble, and he will buy. There is a quantity market,—not quantity as measured by automobile standards, but enough for a very satisfactory production. To exploit it, we must determine its peculiarities. With that object, we have assembled here the story of private operation in those foreign countries where it has been most popular, and we have coupled with it from the American point of view the opinions of owners, builders, and distributors. No trade magazine could perform any greater service to the American airplane industry than in assembling all the pertinent information upon private ownership and its peculiar demands.

It is particularly appropriate that this connection be stressed, and that private piloting should be given its due, at the present time, because this year more than ever before the Air Race management has recognized the connection for itself. Events reserved for the amateur appear upon the program, and the industry should observe their popularity and watch their outcome with eagerness and anxiety. If amateur flying is to have the place that it should, and if the construction of airplanes for amateur use is to be a real mainstay of the aeronautical industry, those events must succeed, and others like them in years to come must be more successful still.

This issue is then dedicated jointly to the competitors in the National Air Races and to the private airplane owners of America, but most particularly to those select individuals who fall in both classes at once.

FILMS AND FLYING INSTRUCTION

IT IS at least a little odd that the newest of mechanical arts should be ignoring the newest of educational methods. The movies have been pressed into the service of the teachers of geography and history and manual training, but the flying and ground school instructor have yet to organize to secure their aid.

In teaching students to fly, one of the gravest problems is that they have at the same time to acquire a new technique and accustom themselves to a new sensation. Orientators, and a variety of other ground training devices, have been devised to separate the two things, permitting the novices to become familiar with the controls without losing contact with the ground. They would be admirably supplemented by well-chosen films of landings and take-offs and maneuvers in flight, illustrations of what and what not to do, with the corresponding motions of all the controls shown by methods familiar to the "animated cartoonist."

The ground school can get even more help from the films. Aside from the fact that it is not always possible to keep on hand such a wealth of demonstration equipment as might be desirable, a whole class cannot watch in detail the motions of an instructor at work on an engine or instrument. The camera, always able to take the best point of vantage, able to make repeated trials until precisely the right view is secured, and able to slow the motion down as desired, usefully supplants the vision of the individual. There is scarcely a subject in the ground school curriculum that could not be simplified by the introduction of properly planned film.

No one school can afford the burden of cost of preparing an adequate amount of such material. A number of them grouped together could well make it worth while. There are companies, engaged in industrial and educational film production, for which the work would be mere routine. Two years ago the aeronautical and moving picture industries met at a banquet to compliment each other and celebrate their mutual assistance. Here is a concrete opportunity for real and useful cooperation.

ONWARD THE COURSE OF MERGER

MERGERS in industry are bull market phenomena. The manufacturers and operators of aircraft were conforming strictly to pattern when they became energetic in pooling their interests, with simple exchange of stock or with the issuance of new securities, during the final stages of the great upswing that came to an end last November. It is more remarkable, and a better evidence of a real economic need for a reduction of the number of independent units, that the process of merging and of acquiring control should still be going forward in this summer of general financial disillusionment and discouragement.

To be sure, there are no strictly new combinations of the first order. To be sure, the absorption of one unit by another has recently been limited to the transport field. It is, of course, natural enough that the emphasis should be thrown there. The Watres Act has offered an extra stimulus to the effort to get the existing lines together, and for once the government is actually encouraging combination, instead of standing with upraised big stick ready to break the back of any attempted reduction of competition. Already there is a greater measure of concentration of control in air transport than has ever before existed in any widespread American

transportation service. Three companies now control almost exactly two-thirds of the total domestic operation with mail or passengers, and another merger that can at least be considered as a strong possibility will increase their share to three quarters.

We will not answer for what we may think five years hence. The dangers of unrestrained monopoly may arise, and detailed government control over service and rates may unhappily become necessary, but under present conditions a reduction of the number of independent operators, and the formation of great groups covering the whole country, has become essential if air transport is to survive at all. In the present formative stage of the business, and while the total traffic remains comparatively light, it is indispensable that the number of separate units should be small if they are individually to be large enough to support a proper organization for technical control and supervision.

But the making of big companies out of small ones is not to be confined to the transport world. It is even more definitely indicated in airplane manufacturing, where merging activities are sometimes supposed to have terminated for all time with the formation of United Aircraft, Detroit Aircraft, and Curtiss-Wright. The airplane industry is now, in respect of its general internal structure, precisely where the automobile industry was in 1914. There are a wealth of independent companies, some of them serving only a local market, some doing too small a business to maintain proper engineering or sales departments or to carry on proper advertising campaigns. For a majority of them, the choice in the long run will have to be between merger and elimination. The first is the pleasanter alternative. The ten largest manufacturing groups are now responsible for 70 per cent of the airplanes built in the United States. Within six years that figure will have increased to well over 90 per cent. We make that prophecy with such confidence that we offer it as a flat statement of fact. The wisest of the small independents will recognize the prospect and will meditate upon the advisability of seeking alliances.

BERMUDA GOES SOVEREIGN

EXACTLY what happened to Roger Q. Williams as a reward for flying to Bermuda remains in doubt, the answer lost somewhere between the Department of Commerce, the British Embassy, and the gubernatorial residence in Hamilton. At least this much is clear. Somebody in Bermuda made it evident that that colony, small though it is, respects its own sovereignty and expects others to do likewise.

Off-hand, it seems a silly thing and a somewhat churlish action, to protest against the very first flight successfully to span the Gulf Stream and reach the Bermudan group from the United States without mishap or delay. Officials, rigorously maintaining the prerogatives of their offices without the exercise of discretion or even of judgment, are prone to make themselves appear ridiculous. The customs inspectors who received the Graf Zeppelin on her first voyage to Lakehurst succeeded handsomely in doing so. So did the attache of the Public Health Service who was reported to be exercising a vigilant guard over the preparations for Costes' first trans-Atlantic attempt, alarmed lest trachoma or bubonic plague should be imported into the United States in a non-stop flight from Paris. So did the British functionary who received Gertrude Ederle, as she came ashore from her Channel swim, with a demand for her passport.

Nevertheless we shall do well to regard the Bermudan side. Without reference to whether or not Mr. Williams had made in due form his application for permission to enter British territory, indubitably certain American pilots have shown a large and haughty contempt for international formalities and for the susceptibilities of other peoples. Every nation, including our own, maintains its absolute sovereignty over the air above its territory. Certain nations have made mutual concessions, or derogations from that unrestricted sovereignty, by adhesion to an international convention. It is as well to remember that America has so far refused to have anything to do with that convention, that we stand aloof from the document which twenty-seven states have now ratified, and that to that extent we are outlaws in the world of international aviation. Our reasons for non-adhesion may have been excellent. They may still be quite adequate. We do not attempt to argue the point. The important thing for the moment is the fact. When an American airplane goes over Bermuda, or Uruguay, or Denmark, or Siam, it is by a special and individual permission from the local government. We cannot demand that permission as a right. We can only request it, either as a favor or in return for some concession on our own part. If in any case it is refused, it will do us no good to get excited about it.

We hazard a guess that Bermudan objections (if any) to American airplanes have a motive much deeper than a mere sense of pique at the ignoring of certain formalities. The permanent residents, and especially the government, of the islands are loyal to the British Empire. When they are to have air service, they would prefer that it be a British service if possible. Eight years ago a British company prepared to make the attempt, but gave it up as a bad job. No one in the Empire seems ready to undertake the operation now. From the point of the Anglo-Bermudian, it is best to keep the thought of aviation in the background for the moment, and to have no air transport at all until it can fly the flag of Imperial Airways. Obviously this is unofficial interpretation, and the merest inference, but we venture it as a speculation on official Bermudan psychology—and that of various other parts of the earth.

The matter is for decision by the local populace and their government, but manifestly we hope that they will

decide it in favor of a free admission both of individual American pilots and of American commercial enterprise. Our best hope, aside from a firm confidence in the fairness, far-sightedness, and equity of the policies that will be adopted by a British people, is the American tourist. Bermuda's chief source of revenue is the visitor from the United States. If he wants an air mail service badly enough so that he is likely to make his visit contingent upon its provision, he will get it. The tourist companies can exert a powerful influence for a liberal attitude. Aeronautical interests can best help their own cause, in Bermuda and in various other quarters, by displaying a considerable degree of restraint and the most delicate regard for the susceptibilities of the peoples concerned, and especially by being meticulously careful to comply in every detail with every legal formality of international flying.

SAFETY . . .

IT CAN BE DONE

IN THE fiscal year 1925, the airplanes of the United States Navy and Marine Corps flew 4,253 hours for every fatal accident. Late in 1926 the authorities in the Navy Department made up their minds that accidents were not a necessary incident of efficient naval flying operation, and that it would be a good idea to stop having them. A definite plan for their elimination was drawn, and put into effect. It demanded nothing more complex than that every accident should be analyzed, that the results of the analyses should themselves be pooled and correlated and lessons drawn by officers to whom that was given as their primary duty, and that there should be a definite effort to make safety a major interest of the personnel of the service. The results are a matter of record. The flying hours per fatal mishap were raised to 7,226 for 1928, to 11,289 for 1929, to 18,150 for the fiscal year just ended. In five years the hazards of naval flying have been reduced by appreciably over two-thirds. To put it in other terms, if the fatality rate were to have remained as high now as it was five years ago, somewhere between forty and sixty officers and enlisted men of the naval service now peacefully pursuing their careers and enjoying good health would be dead as the result of the past year's accidents—accidents which would have happened at the old rate, but which actually did not do so.

Take another example. Leave the airplane to itself for a moment, and look at the railroad. American railroads in the first decade of the present century were in their essential features what they are today. The air-brake was available, and electric signalling systems were in use. There was a certain passenger fatality rate, not a very high one. Modest though the hazards of railroad travel then seemed, they were halved between 1905 and 1910. They were halved again between 1910 and 1921. They appear to have been halved once more between 1921 and 1928, a total reduction of nearly ninety per cent in passenger hazards in twenty-five years. No miracles were wrought. There was no sudden and general introduction of any automatic safety device. A general adaptation of the best equipment commercially available, a general determination to let no safety practice go by and to let no dangerous practice go unchallenged, a general tightening up and increase in watchfulness were responsible.

It can be done. The safety of air transport is not to be secured by slogans nor by arbitrary rules, however few or however many, nor by prayerfully waiting upon the arrival of non-spinning airplanes or helicopters or automatic parachutes. Mechanical improvement is earnestly to be sought, but a very high degree of safety can be attained by the application of nothing more mysterious than common sense and caution. American air transport shows several companies with a history of absolute freedom from accident. Taking all our air lines together to get a broader statistical base they have made an admirable safety record, but it affords no reason for resting upon the oars. It can and it should be ten times as good as it is. It wants only esprit de corps and determination for further and indefinitely continuing improvement.

The term "accident," although we use it for want of a better one, is only one degree less unfortunate than the unhappy expression "act of God." Literally speaking, there is no such thing as an accident. There is always a predisposing cause. It is a common statement that somewhere between eighty and ninety per cent of the misadventures which commonly go by the name of accidents are due to the "human factor." From that statement lay interpreters draw conclusions sometimes sinister and sometimes absurd. We shall go further, and provide a still more startling percentage. Not ninety per cent of aerial catastrophes, but ninety-nine and a substantial fraction, occur because the human element failed. There is not one accident out of a thousand which could not be traced, if every pertinent antecedent detail were known, to the fact that somewhere along the line of development or maintenance or operation of the airplane someone concerned slipped or nodded or simply did not know his job. It may have been an inspector in the factory or a mechanic in the transport company's shop. It may have been a pilot, or a weather observer, or a purchasing agent, but wheresoever the fault may have lain, for the passengers in the airplane the results are likely to be very much the same.

Commercial air transport can advance in safety precisely as naval aviation or American railroad services have done. We need only fear not setting our own standards high enough. There is just one requirement for progress. Every individual involved, from the president of the company down to the messenger boy, must not only follow the rule-book but feel a sense of individual responsibility as profound as though he were running the service single-handed.

Statistics of the Month

NEW material further supplementing the statistical issue, AVIATION, March 22, 1930, is given herewith. As announced in our April 26 number (which carried the first supplement) such data will appear regularly each month for the use of those who wish to keep the curves and totals up to date. Page numbers in the statistical issue are given.

EXPORTS

(Pages 594 and 595) Detailed export data for the first half of 1930 were published in the August 2 issue, page 6, of THE AVIATION NEWS. *Cumulative totals to June 30 (six months) are*

Number of aircraft	168
Value of aircraft	$2 838,484
Number of engines	183
Value of engines	$832 784
Value of parts	$1 141 452
Total value of exports	$4 812 720

AIRPORTS

(Page 582) Airport Statement as of July 1, 1930

Municipal airports	580
Commercial airports	550
Intermediate fields	106
Government fields	81
Auxiliary fields	210
Total number of airports	1 455

LICENSING

(Pages 560, 561 and 562) Periodic Airplane License and Identification Data July 31, 1930

Licenses valid	6 811
Identifications valid	2 155
Total licenses and Identifications	8 966
Ratio of licenses to total	0 750
Number of pilots licenses valid	15 658
Number of mechanics licenses valid	8 921
New pilots licenses issued during July, 1930	
Private	569
Industrial	0
Limited commercial	45
Transport	156
Glider	70
Ratio of licensed pilots to total planes	1 521
Ratio of licensed mechanics to total planes	1 004

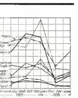
QUARTERLY LICENSE DATA

ON PAGE 569 of the March 22 issue we presented a tabulation of the makes of aircraft and engines in planes licensed quarterly during 1929. The tables appearing on this page are a continuation.

The five largest manufacturing groups received 40 per cent of the licenses issued during the first six months of the year as compared with 47 per cent during the last six months of 1929.

The ten largest, taken together, received 68 per cent of all licenses issued during the first six months of 1930 and 67 per cent of the licenses issued during the second half of last year. However, while the percentage these particular planes form of the total number licensed has remained about the same and no definite tendency towards concentration of the industry by elimination or absorption of the weaker units is as yet showing results, the total number of planes licensed during the first six months of this year has dropped 51 per cent under the total for the last six months of 1929.

With regard to the power plants used in the planes recently licensed, the war surplus engines still account for 29 per cent as compared with 31 per cent for the last half of 1929. It is evident that the number of war surplus engines is decreasing very slowly. Foreign engines account for but 5 per cent of the engines used in planes licensed during the first half of this year. Of the total number of domestic engines used five manufacturers account for 79 per cent as compared with 86 per cent for the last half of 1929.



Number of planes licensed for last quarter of 1929 and first quarter of 1930

Make of Plane	Licensed First Quarter 1930	Licensed Second Quarter 1930	Total
Aeromarine Klemm	7	10	17
American Eagle	30	39	69
Arrow	7	8	15
Bird	5	18	23
Boeing	5	1	6
Cessna	10	4	14
Command-Aire	6	10	16
Curtiss Robin	17	41	56
Eaglerock	34	52	86
Fairchild	46	38	73
Fairchild monoplanes	[illegible]	17	39
Fairchild KR	23	21	34
Fokker	11	7	18
Ford	6	9	15
Fleet	19	49	68
Great Lakes	20	24	44
Lincoln	20	18	38
Keystone-Loening	7	10	17
Lockheed	7	10	17
Mono Aircraft	26	47	71
Monocoupe	18	[illegible]	[illegible]
Monoprep	8	12	19
Moth	38	24	62
Nicholas Beazley	15	11	26
Parks	6	0	6
Pitcairn	8	10	18
Ryan	14	19	11
Sikorsky	14	4	18
Savoia Marchetti	10	4	14
Spartan	24	7	31
Stearman	20	8	28
Stinson	23	64	87
Swallow	14	18	32
Travel Air	62	57	119
Biplane	[illegible]	[illegible]	103
Monoplane	10	[illegible]	[illegible]
Waco	69	116	185
Miscellaneous	140	94	234
Total	719	822	1 541

Make of Engine	Licensed First Quarter 1930	Licensed Second Quarter 1930	Total
Axelson	4	0	4
American Cirrus	23	28	51
Comet	1	2	1
Curtiss	21	25	46
Hess Warrior	3	3	6
Kinner	90	121	211
Lambert Velie	30	55	85
LeBlond	37	27	64
Lycoming	5	60	63
P. & W. Hornet	17	12	29
P. & W. Wasp	45	55	80
Wright Cyclone	2	2	4
Wright Gipsy	0	13	13
Wright Whirlwind Series	171	119	290
Miscellaneous	1	12	13
War Surplus Engines			
Hisso	24	29	53
Liberty	0	1	1
OX5	161	212	575
OXX6	11	9	20
Foreign Engines			
DH Gipsy	38	13	51
Siemens Halske	4	2	6
Walters	5	0	5
Miscellaneous	11	7	18
Total	719	822	1 541

TEN YEARS OF AIR RACE PROGRAMS

By R. Sidney Bowen, Jr.

Managing Editor of AVIATION

Every year since the inauguration of the National Air Races, ten years ago, the program of events has been in keeping with aeronautical progress. A review of the programs is, in a certain sense, a review of the development of the industry during the last decade.

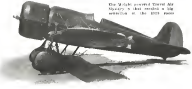
TEN years ago the National Air Races known at that time as the Pulitzer Races, consisted mainly of a feature high speed race open to planes of the military services This year the National Air Races consist mainly of races open to privately owned and commercial planes Ten years ago the bulk of the flying in this country was military Today civilians are spending the greatest amount of time in the air In the same manner that aviation in this country has passed from government monopoly to private enterprise so have the events in the National Air Races changed from a majority of military contests to a majority of civilian races A review of the year to year progress of National Air Races events is more or less a review of aeronautical development in this country during the last decade

Although in addition to the Pulitzer Race at Omaha in 1921 there were a few war surplus stock races, it was not until the 1922 races at Detroit that civilians played any really important part One event was an all civilian affair It was an On to Detroit Race and the winners were chosen according to points obtained by a formula based on elapsed time, miles flown, average speed and engine power

At that time the air mail service in the country was getting well under way, and as an incentive to bigger and better postal service operations the program included an event known as the Detroit News Aerial Mail Trophy Race Unfortunately though the contest was limited to multi-engined planes carrying pay loads of 800 lb or more, and as no planes of that time were in the air mail service at the time, the twelve Post Office Department ships that were on the field stayed right where they were while Army pilots competed for the trophy in Martins Incidentally military pilots flew away with honors in all of the five events open to both military and commercial planes

In 1923 at St Louis the story was different Not so much with respect to commercial pilots showing their elevators to military planes, as with respect to a start toward segregating military and commercial races For example, at Detroit the race for the Aviation Country Club of Detroit Trophy was competed for by three military planes and only one commercial job At St Louis, though, of the seven starters only one could be regarded as adapted from the military The only three planes to finish were commercial craft

In 1923 also there was an all civilian closed course event in addition to the all civilian On to St Louis affair And as a help to the youth of the country who were beginning to turn their thoughts to things aeronautical the St Louis program included a rubber band model plane contest One might almost say that this event was the first privately owned plane event to be placed on a National Air Race program



The Wright powered Travel Air Mystery S that created a big sensation at the 1929 races

Charles L Lawrence in front of the Wright-Bellanca cabin monoplane, one of the big features of the Philadelphia Races in 1926

The air mail pilots who were cheated out of an all-in-the-family race at Detroit came into their own at St Louis The multi-engined clause was removed and 15 D H air mail planes put on a fine show Thus out of the nine events on the program, five (including the youngsters' rubber band contest) were non military

The 1924 Dayton races brought out the fact that commercial flying had gained even more on the military Of the eleven events on the card seven of them were all commercial contests Of course it should be remembered that the Pulitzer Trophy Race was the great feature, and had been since the very start As a matter of fact the National Air Races of today are the outgrowth of that high speed government plane race. But as has already been mentioned, so is civilian aviation today the outgrowth of government pioneering and assistance

Lieut G T Cuddihy, U S N, taking a pylon in a Boeing FB-3 at the 1925 National Air Races at Philadelphia

However, the commercial pilot was beginning to occupy a bigger and bigger space in the National Air Race sun, and the 1924 races give us a rather clear idea as to the rate of growth of commercial activity in the air at that time

For example, take the On-to-the-Whatever-it-was-City-race In 1922 seven pilots competed In 1923 twenty-seven planes took off And in 1924 a total 52 jobs of commercial (and backyard design) were flagged away to Dayton from various parts of the country.

Up to 1924 most of the commercial planes, except the air mail jobs, were powered with the dear old OX-5, but at Dayton the program included two races for light planes with engines of not more than 80 cu.in displacement (about 20 hp). That was the first time in National Air Race history that the baby jobs had a chance to strut their stuff Strut they did, and incidentally, most of the entries were built by the pilots Therefore we might regard the Dayton affair as the beginning of privately owned plane races on a National Air Race program

In many respects the 1925 races at New York were as significant as were the Dayton races To begin with, although military and commercial planes had been gradually competing against each other less and less, it was at New York that definite steps were taken and a program prepared whereby no military or commercial planes flew against each other Another thing was the inauguration of side-show events At New York the military services staged a sham battle with ground forces, laid smoke screens, executed delayed opening parachute jumps, dropped dummy bombs and various other gallery catching items The civilian pilots did their stuff too in the form of sky writing, balloon bursting, and aerial circus stunts

IN keeping with the stabilization of Air Race events, the light plane contests at New York did much to prove the practicability of light planes when powered with suitable engines. Of course the war surplus stock of

planes and engines were still in the majority, and Casey Jones in his famous Curtiss Oriole was still leading the way across more than one finish line However, at New York there were some promising designs of both planes and engines entered in the various events, and therefore it might be said that the 1925 affair marked the first really noticeable trend of commercial aviation away from war time designed equipment

Incidentally the New York races were the last races of national character held on a military field Every year since then has seen the races on a commercial field and although the show has been made spectacular by military participation (in every conceivable form) it has at least been conducted under civilian supervision

The year of 1925 was also the last time that the Pulitzer Trophy Race was flown And so all in all, that year witnessed the passing of National Air Race event monopoly from military fliers to commercial fliers

THE program of events at the 1926 races in Philadelphia was proof positive that the affair was most decidedly under civilian supervision Out of 19 events only five were exclusively military And one of those was open only to National Guard ships

The race results brought to the attention of the industry some particularly interesting and new designs, the most prominent being the Wright powered Wright Bellanca, the Pitcairn Sesqui-Wing and the little Driggs Dart However, there was not really as much advance made in design as the planes at the races led one to believe For example, Casey Jones still led the way in a plane of 1921 vintage over up-to-the-minute designs Jones' victories indicated that more design progress should be made, and that race rules be written that would encourage the commercial designer One feature of the 1926 show was the increase in the number of commercial air organizations putting up trophies for competition by commercial pilots

And then came the 1927 races at Spokane and the first showing of a profit by any National Air Race management From the standpoint of new events the National Air Races that year were featured by air derbies Heretofore, there had been an On-to-the-Place race with the contestants starting from various parts of the country But in 1927 the air derbies were put on the program and all entries in each derby took off from the same spot Of course the races were held at the end of that Lindbergh year, and as a result brought out many new designs Planes of two and three passenger design were most conspicuous Of course the old JN-4 had passed into the junk heap by that time, as far as air racing was concerned However, its power plant the OX-5 was still very much among those present Yet perhaps not in as great a number as the previous air race years

The closed course events flown off at Spokane give one the idea that the management realized that it was military participation that put air races across, because of the twelve events (exclusive of the derbies) six were military contests and six were civilian Not for a long time had there been so many military events in the National Air Races

One interesting item with regard to commercial planes competing at Detroit was the fact that rather than each race being a contest for certain types of ships it was a race for planes with certain types of engines That of course did not apply so much to the so-called motor cycle engined planes, but in many cases a plane with let us say an OX in it would fly in one race, and in another race would be the same type of plane powered with a Wright J5. The reason for that was of course the fact that entries were judged on cubic inch piston displacement and not type of plane Undoubtedly the idea of such a ruling was to encourage the building of the plane around horsepower instead of just shoving any horsepower available in whatever came off the drafting board If nothing else, the planes at Spokane brought out some clever streamlining ideas, particularly those that had an OX in the nose

Side show events were more prominent than ever at Spokane, and as usual military planes landed in the spotlight and stayed there Although it has little bearing on the progress of events in National Air Races up to 1927 it should be mentioned here that although the year 1927 saw the monoplane come to the fore there were only nine planes of that type on the field at Spokane However, the monoplane had its Air Race day coming

AS the aviation industry traveled at top speed in 1928 so did the National Air Races That year they were held in Los Angeles and the program of events might be termed a program for 'the greatest air show on earth.

It is no doubt that the race management took a leaf from Barnum and Bailey and Ringling's book

Similar to 1927 there were air derbies from various parts of the country In addition though, there was an inter-nation derby starting in Canada A non-stop derby did not materialize The only two contestants stopped too soon

There was a total of 18 closed course events held at

The start of the 1929 Women's National Air Derby from Clover Field, Santa Monica, Calif

the field, and eleven of them were military affairs That in addition to the military stunt teams present took the show away from the commercial pilots.

However, from the standpoint of actual air race event progress the blue ribbon was awarded the commercial planes There was nothing to get excited about in increased speeds of military planes, but commercial ships showed considerable progress over 1927 in such respects as speed, cleanness of design and all-round dependability of both plane and engines. The progress made in engine design was brought out most clearly by the events at Mines Field. The industry had long been waiting for an engine, or engines, to take the place of the war surplus OX-5, and the engines at Los Angeles showed that remarkable strides had been made to fill this need Incidentally, it was at Los Angeles that the commercial built monoplane made its first serious, and successful, bid for recognition as a National Air Race winner

With no idea of criticizing the management at Los Angeles it must be stated that the program of events was drawn up with the idea of attracting the public to the scene rather than encourage designers to produce something better True there were several civilian free-for-alls where cubic inch piston displacement was the only governing factor, and therefore suggested a chance for cleaning up of the design However, there was really nothing for the designer to aim at. And even if he had aimed and hit home his accomplishment would have been lost in the swarm of military events and side shows Perhaps, after all that is just as well for it must be remembered that in 1928 the public was at fever heat regarding aeronautics and so long as the show was spectacular it could be regarded a success

The above comments do not apply to the air derbies It will be remembered that one or two "mystery" planes showed up for the takeoff and that many complaints were placed on record by the pilots who had entered regular stock models The mix-up was straightened out eventually, but many believed that in future air race committees should include an experimental ship derby in addition to a stock model contest

Beginning with the Philadelphia races, or since National Air Races have been under civilian supervision, each succeeding race committee has profited from the experience of the preceding year In addition, each year's program of events has been drawn up to be in keeping with the development of the art

The 1929 races at Cleveland presented a splendid example of the above mentioned points

FLYING had caught the eye of many of the ladies of the land and by 1929 more than a hundred of them had a pilot's license In keeping with the woman's aero invasion events open only to them were included in the Cleveland schedule In addition the first women's air derby was flown from California to Cleveland.

Although military planes were present at Cleveland in great numbers there were enough interesting commercial pilot events on the program so that the Army and Navy planes did not walk away with the show as they had done in the past Incidentally, there was not the opportunity for Army-Navy competition like at Los Angeles The result was that apart from separate service races and a Navy exhibition team all military flying was of an educational nature

The civilian events at Cleveland gave every indication of having been planned with the idea of making it possible for manufacturers to determine the worth of their latest development For example, there were races only to closed cabin planes based on cubic inch piston displacement, races for transport planes only, a contest for multi-engined ships, and a civilian experimental plane race as well as open ship contests Not only had the management mapped out a program to attract the public but it had also planned it so that the contests would be of real benefit to the industry as a whole

In short, we might say that from a standpoint of National Air Race programs the one at Cleveland was the most intelligently planned in the history of the famous classic What those races brought forth in the way of new developments is well known to the readers of AVIATION It seemed that for once aircraft manufacturers really had something to aim at in National Air Races And, by way of comment the aim of the Travel Air Company with its Mystery ship, which scored the first commercial victory over military planes, was well nigh perfect!

If one were to make any criticism of the Cleveland program it would be that there were too many events Exclusive of the side shows and cross country contest there were a total of 26 closed course races at the field Of that number six were military and 19 were civilian The other race was the free-for-all high speed affair It will be noted that the civilian races outnumbered the military three to one. That was the greatest civilian event monopoly in the history of the races.

It is also interesting to note that of the 19 civilian closed course events four of them were open to women only One wonders if perchance the day is coming when air race event monopoly will pass out of the hands of the sterner group

AND so we come to this year's program at Chicago A glance at the list of events tells us that once again the race management has laid out a program in keeping with the development of the industry Of the 39 closed course events only five are exclusively military There are events for women only in both opened and closed ships as well as similar events open only to men pilots Like it was at Cleveland, there are races limited to certain types of planes It is logical to assume that the results will bring forth even more bigger and better and faster designs

The important items on the Chicago program at least from the standpoint of industry progress, are the races open only to private plane owners, or sportsmen pilots In the sportsman pilot the small plane manufacturer sees a most profitable market A market that, while at its low ebb at present, holds forth splendid chances for development It is therefore a very wise idea on the part of the race managrment to encourage the private owner by including that type of race on the program

Another innovation at Chicago is the race horse start idea and the penalty for tail skids on winning planes The results of these events will undoubtedly bring many interesting things to the industry's attention

Thus it will be seen that since its inauguration ten years ago, the National Air Races have reflected the growth and development of the industry The military services gave them their start Eventually they passed into civilian hands It is certain that they will remain there, but whether they take on a strict amateur status or remain professional is problematical. It is quite possible that they will go on being both a professional and amateur pilot affair And that, perhaps, is just as it should be

AN AMATEUR PLANE FOR THE AMATEUR PILOT

By Earl D. Osborn

President, Edo Aircraft Corporation

Why is it that sport planes which perform beautifully in the hands of a veteran pilot are sometimes apt to be crashed when in the hands of the amateur? Is it because the manufacturers let experts pass judgment on their products, and make no serious attempt to analyze flying difficulties from the amateur's point of view. ¶In the accompanying article Mr. Osborn presents some particularly interesting views regarding an amateur plane for the amateur pilot.

ALMOST anyone can learn how to fly an airplane With a little preliminary instruction as to how the controls work, the average intelligent person can within half an hour be competent to guide it in still air. and within an hour or so, most people will be able to make fairly decent turns Learning to fly in rough air takes a little longer, but it is safe to say that the average person capable of driving an automobile can learn to control an airplane quite effectively and safely under normal wind and weather conditions in two or three hours Why then does it take 250 hr of solo before a commercial passenger carrying license is granted? Why do aerial transport companies as a rule employ only pilots with over 500 hr. of flying? Why do Navy statistics show that a man who flies only 100 hr a year runs more risk than a man who flies four times as much?

Part of the answer lies in the skill and judgment which it is necessary to use while flying in foggy or abnormally windy weather. This applies especially to airline pilots, but even here only a small percentage of accidents are due directly to bad weather In the case of private pilots, with which this article deals, weather is not so important a factor Private pilots do not need to fly through the thick weather that commercial pilots meet, and the violent winds of thunderstorms and tornadoes are rarely encountered Once well in the air a pilot does not fear any ordinary wind It is rare for even an inexperienced pilot to lose control of his airplane while doing normal flying at an altitude of more than a thousand feet

Yet flying on the whole is difficult to learn as compared to driving an automobile or motor boat, and besides it requires constant practice to maintain proficiency Ever since the Wright brothers first flew, aeronautical engineers have endeavored to make it easier by making their airplanes more maneuverable They have succeeded until an expert pilot can with ease and practice do the most astounding maneuvers and yet remain under perfect control at all times It is the writer's contention. however, that designers have given too much consideration to stunting performance, and have not spent sufficient time in endeavoring to analyse the real difficulties of flying from the amateur's point of view. They have let expert pilots pass judgment on their planes, but have not realized what made their planes crash in the hands of inexperienced pilots. If a complete and true analysis of the difficulties of flying could be made there is little doubt that solution could be found for many of the difficulties This article endeavors to point out some of the difficulties and suggest possible solutions.

Disregarding bad weather the difficulties in flying lie in the maneuvers necessarily connected with taking off and landing The ideal machine for taking off would be one which rose vertically However, this article confines itself to possible improvements in existing types of airplanes The angle of climb varies greatly in present-day planes and certainly the machine with the best angle of climb rather than the best rate of climb is the safest A machine that climbs 500 ft p m while flying at a forward speed of 50 m p h is safer than a machine that climbs the same distance in the same time but is only going forward at a rate of 80 m p.h. There are many machines with a rate of climb of 500 ft p m which will clear obstacles that a faster machine with a rate of climb of 750 ft p m would run into The added safety seems obvious but we still persist in rating our machines by their rate of climb rather than by their angle of climb Especially during the past few years there has been a very questionable tendency to disregard the angle of climb in favor of higher maximum speed

As the take off consists of straight line flight, it is easier than the maneuvers incident to landing, the only danger outside of motor failure being loss of control in an attempt to climb up too sharply Most machines as

The Curtiss "Tanager" the winning plane of the Guggenheim Safety Competition, to develop qualities that lessen the demand on the pilot's skill.

built today will go off into a spin if pulled up too sharply, but machines have been built which can not be spun However, spinning is considered essential in flight training and therefore manufacturers of small planes have deliberately included spinning as a characteristic of the planes which they are trying to sell to amateurs It is hoped that some day a manufacturer will have the courage to break away from the combination of training and amateur plane and build a machine which cannot be spun There is no doubt that it can be done and with good designing it should not involve too much sacrifice of maneuverability and lightness of control

ELIMINATING spinning would certainly make flying safer and easier for the amateur However, there is nothing in sight now which will prevent a pilot pulling up too steeply, and losing flying speed It is under these conditions that the safety reserve in a plane is brought out It should not fall into a violent whip stall, and certainly aileron control should be provided which is effective way beyond the stalling speed Aileron control at speeds below stalling has been greatly improved and it is to be hoped that the floating aileron may offer a complete solution There are possible other forms of control such as rotors on the wing tips which would function irrespective of the angle of incidence, and complete lateral control at low speeds is certainly a line of development which deserves more attention than it has received Probably there is not one flight in a thousand when this control would have to be used, but an analysis of crashes would show that the controls had failed to respond just when they were most needed

Complete vertical control is impossible because the law of gravity brings the plane earthward unless it is counteracted by sufficient engine power There is therefore, no sense in devising longitudinal controls which are effective more than a certain amount beyond the palne's stalling speed It will settle anyway In the case of lateral control the matter is different Lateral control must be powerful and effective way beyond the stalling speed, for though good pilots do not often stall, poor ones do Wind gusts will throw even the best pilots into a stall even though it happens only once in a million miles of flying

However absolute lateral control way beyond the stall involves certain dangers If any control is made too effective it may render the other controls inoperative For example if the controls were crossed too powerful ailerons control would cause a side slip which would inevitably end in loss of control The proper adjustment of fin areas aod dihedral to control areas is a very delicate task As mentioned later in the article a combining of the rudder and aileron controls or an automatic aileron control might be a solution

The dangers of loss of flying speed in taking off are equally great in landing but they are accentuated by the fact that the pilot is apt to be maneuvering and looking around at various objects instead of merely concentrating on flying in a straight line Besides the danger of loss of control there are many difficulties in landing which are either not realized or which are accepted as inevitable by the experienced pilot But they make flying difficult to learn and are a constant source of worry and actual danger to the amateur The first of these is judging the spot from which the glide should be begun Granting that the pilot does not aim short of the field and may use his engine to get over the fence he will begin his glide at an altitude of between five hundred and a thousand feet It is impossible for even an experienced pilot to judge whether he has an altitude of seven or of eight hundred feet, yet if he is a hundred feet higher than he thinks he will overshoot his mark by roughly a thousand feet and if he is one hundred feet lower he will undershoot by a thousand feet The sum of these distances is the total length of many fields In practice many American pilots use their engines to get into a field in spite of the evident danger of the engine's not catching The more efficient a plane is the better will be its gliding angle and the harder it will be to land on the required spot A really efficient plane such as a Lockheed Vega must be fish tailed and side slipped unmercifully in order to slow it down sufficiently to land in a restricted area Such maneuvers in order to loose altitude and slow down are difficult and unpleasant for an amateur We have even seen good pilots overshoot a field, and the end of several transcontinental flights has been through the fence because the pilot was too tired to do the necessary quick maneuvering. In spite of the increased size of the landing fields the greater gliding angle of airplanes are making them ever more difficult to bring in Even at present a solution is needed for amateurs and it is hoped that soon planes will become so efficient that even professionals will give up side slipping, fishtailing, etc

Two solutions have been experimented with One is the air brake, and the other is the machine with sufficient

control and shock absorbing quality to squash down in a very poor gliding angle. If by either means we can obtain a machine that will come down at an angle of five to one instead of an angle of fifteen to one a mistake in altitude of 100 ft. would mean overshooting the mark by only 500 ft. instead of 1,500 ft. The air brake, whether it is a reversing propeller, a turning strut as in the Puss Moth or a spoiling of the leading edge allows the plane to be dived at a steep angle without picking up too much speed. As soon as the brake is released, the plane resumes its natural glide and so stretching the glide ceases to be an impossibility. The disadvantages are that the plane has to be levelled off before landing, and the possibility of picking up too much speed or of braking so hard that a stall results.

The other solution is the squash or pancake landing such as was made by the Guggenheim ships. To land, the pilot merely pulls back the stick till he slows down and starts settling at an angle of four or five to one. The pilot does not have to level off when near the ground which is always a delicate maneuver, and as he is always flying at a minimum speed he has no need to watch his speed indicator nor the angle of the plane in relation to the ground. Levelling off at the proper height is one of the real difficulties of flying. It takes hours to get the knack of it and pretty constant practice to do it well at all times. If all the amateur had to do to land was to pull the stick back and wait till he landed, he would find flying easier and more comfortable.

The squash landing has the disadvantage of not enabling the pilot to stretch his glide except by use of his motor or by putting the nose down and assuming a normal glide instead of a stalled glide. This last maneuver is only possible when the machine has plenty of altitude. As both systems have their advantages it is possible or even probable that the two will be combined. That is, a pilot will approach his field in a very steep glide with the brakes full on so as not to get up too much speed and when he gets within 50-100 ft of the ground, he will pull the stick back and pancake down onto the field. The old time pilot will say that such complications are highly unnecessary that he can maneuver into a minimum of space with a maximum of accuracy. True perhaps for the old timer who flies constantly, but not true for the amateur nor even true for the professional flying a very clean and efficient plane. Landing must be simplified so that the amateur can spend his time watching where he is going instead of concentrating on maneuvering the machine.

This brings us to the pilot's mental condition. If the pilot is hampered by a machine with bad visibility, if he is tired because of the noise and vibration of the engine, if he is afraid of a spin, his hand is not functioning as it should. Peace and clearness of mind is essential. Many amateur pilots can fly very decently from their home field, but fly badly when they try to land in a strange field or when they are faced with a Department of Commerce inspector. This is perhaps the greatest reason for slow flying and landing speeds. The average person if required to think too quickly gets rattled and runs out of knowledge. Give a person plenty of time to look around and size up and he will make a good landing. Rush him and he may get into a mental haze which is as dangerous as a thick fog. Allowance must be made in design for the psychological fact that when faced with something unusual the average person forgets what he has been taught and falls back on instinct.

One of these instincts is to turn flat when close to the ground. Banking the airplane when one desires to turn is not natural. Some of the early fliers considered that the use of the ailerons was to keep the wings level when making a turn. It has to be taught to all people and some never really learn. If we could eliminate the lateral control and leave only the longitudinal and directional to think about, flying would be much easier. If we could substitute air brakes and pancake landings for side slipping, the only remaining use for the lateral controls would be in side wind landings. As very few amateurs are skilful enough to get away with landing in a strong side wind the loss of this ability would not be a serious detriment to them. Combining lateral and directional controls into one unit is a problem for engineers. It has been done in times past by giving the machine inherent lateral stability and using the rudder instead of the ailerons when it was desired to raise a wing.

With the more modern types of ailerons and especially with the floating aileron, it is possible to have the aileron also give a turning moment in the right direction. There is also the very distinct possibility of having lateral control always correct through automatic mechanical stabilizers. Correct lateral control is a mechanical problem and should not be added to the already sufficient burdens of the pilot. If a pilot wants to turn to the right he should merely have to turn his wheel to the right. The extra control is theoretically superfluous and in practice is one of the real difficulties of flying.

Speaking of controls the writer believes that the differential gearing idea might be put to further practice with advantages. At present a given movement of the control stick away from its neutral point gives the same if not greater results than an equal movement when the control is in an extreme position. The result is that especially at high speeds the machine is over sensitive to small movements of the controls. By differential gearing the controls can be made so that they are less sensitive at their central point and more sensitive in their extremes of movement. If this were combined with a certain amount of inherent stability the controls for ordinary turns would be put and kept in a position which indicates that a turn was being made. As it is now, the position of the controls is no indication of the direction in which an airplane is flying. Lightness of control is very pleasant and every mechanical means, such as ball bearings should be employed in order to get it. However, distinct attention should be paid to the sensation the pilot gets from his controls when the plane is flying dangerously. Sight, the reactions on the semicircular canal, the feel of the wind and the sound of the engine are all used in flying but the feel of the controls is one of the most important indications of what is going on. Controls should be mechanically very easy to operate but they should not be aerodynamically overbalanced.

Reams could be written on the cost, speed, and comfort of planes. These problems, though, are receiving the attention of the industry. Planes are already cheap enough, fast enough, and comfortable enough to sell in much larger quantities than is now the case. The truth is that the public is not mentally comfortable about flying. Until flying is made easier, and therefore safer, the average amateur will not fly extensively. We in the industry are faced with a greater problem than the refinement of detail. We must analyze the difficulties of flying and having analyzed them, we must find the solution.

GETTING THE PUBLIC TO FLY

By William B. Stout

President Stout Air Lines Inc
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SKETCHES BY THE AUTHOR

Eventually everyone will fly! Why not now?

Although other factors played a part the members of the industry itself are responsible for the present status of aviation. In this article Mr. Stout reviews our position and offers some concrete suggestions as to what should be done to get the man-in-the-street off the street and into the air.

The whole problem of aviation and its progress is becoming more and more tied up with the problem of the individual flier.

Without the education of the individual flier, an increase in private ownership of planes—the background even of transport interest—is lost.

The modern bus and truck business came from the development of the passenger automobile. In the same way the real development of transport operations will come from progress with planes and methods for the individual flier. There are three stages to any accomplishment—the first, "What to do"; second, "How to do it"; and third, "Do it."

Aviation is still in the first stage and we are all feeling around at the "What to do" part of the study. If we knew just what to do, we have the engineering background and knowledge to accomplish this end. Finances are available; personnel is ready—if we just were certain on this "What to do" stage.

While we can throw the burden of the present status of aviation back on to the stock market fiasco and the very questionable status in our civilization of the investment banker, yet we must shoulder ourselves a large burden of the responsibility for its failure.

One reason for the failure of aviation is that so many enthusiasts of no experience have been in possession of large influence. Their ideas of what constituted production engineering and sales were the usual ideas of the public rather than sound analysis. To their notion engineering consisted in building a machine that would work. Sales consisted of a kind of super-conversation that would force the public to buy the machine that was built and production was entirely the problem of making the machine as cheap as possible. Most of the firms started in on all three of these ideas wrong—never thinking to mix the three together as a single problem; inter-related and inter-twined so thoroughly that there is no separation possible.

Engineering does not just consist of designing something that will work. It must do much more than that. First, what is designed must be what the public wants although not of necessity what the public thinks it wants. It must not be a cheap design but must be a design that can be built cheaply. Real engineering consists of making a hundred dollar product so simple that you can build it at a profit for five dollars or five cents depending on how good an engineer you are. If you can make the product for that amount in comparison you not only have a cheaper product in sales cost, but an actually better product due to its simplicity.

That is one reason why money has been a detriment to aviation during the past few years. With money available everyone has started out to do things in a complicated way—not being forced to make things in a simple way. If there had not been this amount available their mistakes would have been on so much smaller scale that they could easily have been absorbed in the normal progress of the industry. The various materials which we use for the building of planes today require certain complications, whereas the great engineering problem is one of simplification rather than complication. And so engineering consists of more than just designing a machine that will fly to a certain performance.

Sales is perhaps the greatest single item of all and closely interlocked with both engineering and production. This is the angle which must be more closely watched in order to succeed with the product. I make this statement without apology. That sales appeal is a more important thing than the design of any product, taking it for granted, of course, that the organization has engineering ability enough to make the product do its work. Sell the eye and we have sold the prospect.

Production is one of the greatest misunderstandings of sales. If the production department can see how to lop fourteen cents off the cost of a product they have no vision at all nor care, ordinarily, as to whether they add a dollar or a hundred dollars to the cost effort required to place the product.

The greatest salesman in the world is quality in the product itself!

As an analogy it is possible to build a cheap automobile—designed to be cheap, cheap materials, cheap upholstery, cheap clearances and production methods,

cheap castings and a most excellent top coat of paint Designed for cheapness, these cars can be built cheaply and sold to a cheap market that does not know the difference between a paint job and an engineering job This car can be even sold to a small market on a basis that the more cylinders it has the more quality it must possess, and many people will swallow that

On the other hand, it is possible to build of the same size a most excellent automobile of the finest obtainable material, of the closest possible manufacturing limit, of the most modern production accuracy, with the best material and upholstery, finish, and all details By putting the quality into the car with just enough advertising to let the public know there is such a car, one can sell this car in such quantities that it can be made cheaper than the cheap car because of the selling and sales cost Ten thousand a day of these cars can be moved without particular sales effort and without the necessity of luring brass bands and chorus girls at the various sales agencies in order to move the product In other words instead of selling an excellent product the quality becomes so known that the public buys it without effort on the part of the sales department which is, after all, the cleverest sales of all We have built in this country some privately owned planes but not with any idea of putting the price at a point where we obtain any quantity, and for various and good reasons

One great difficulty with all aviation is that we started with a military viewpoint, and one great difficulty with some of our largest transport companies is that they are accepting the judgment of military aviation experts on all airline problems instead of getting an analysis fitting the problem itself

To train a man for a military pilot you need first a man of excellent physique You need a plane of certain characteristics You need a graduate student of certain capabilities And so our aviation started

Now we are getting to a point where we want to contact the public with this aviation—the man of the street We have a prospect worth $1 000,000 who wants to buy a a $5,000 airplane, and if it were $50 000 it wouldn t bother him, but he cannot afford the time to learn As I said in a former article, [Aviation, April 5, 1930] we must first build the plane that anyone can fly Then we must have the co-operation of the Government agencies for the next step Let me visualize it with golf

When a man wants to learn to play golf he does not go to a doctor for an examination of his heart and liver to see if he can play, nor does he go to an oculist He steps out on the field with a club and a ball and if he can see the ball and hit it with the club you know he can at least play golf 'though he may never be a golfer

Before we let a man even try to see if possibly he may some day become a pilot he must go to a lot of doctors who know nothing of flying, who get goose

pimples when you mention an airplane, who are convinced that only a daredevil superman could ever fly; and unless this man says his eyesight is suitable to flying —though how the hell he knows I don't know—this man can not even go out and fly an airplane to see if he can find the ground For Military and Transport aviation—yes by all means—the present system is one hundred per cent all right but if we are going to get the man on the street to fly it has got to be as easy for him to step into the field and take a lesson as it is for him now to buy a ticket to play around at "Tom Fool' Golf Courses on the corner lots A few years ago we had a lot of sight seers who came out to the field and wanted to make trips over the city for the experience of an airplane ride They enjoyed it—had a good ride and come no more. Others come and want to learn to fly, and we can't take them With a plane designed for this service there should be some way that any man, anywhere, could step into the office of an airport and pay his five dollars for half an hour s instruction or ten dollars—or what have you

Remember I am saying this in no criticism of present systems but as a prediction and fore-runner of what must come before the man on the street is going to take up flying as he takes up golf Flying, in this case will have to be on a sort of a "Model T" basis plane of perhaps more performance but with a very slow landing speed, very excellent vision and, contrary to the power glider exponents, fitted with plenty of power to pull it out of trouble

And so in a sort of conclusion of a rather heavy mess of generalities, let s build a plane that can be more simply flown with the instructor where he can talk to the student while he is working This plane must land at not over 35 m.p.h. in a space of not over 100 ft and be capable of using any twenty-acre field with good approaches for an airport Let's put up a ticket booth, and get a man with a megaphone if you want to, and as Mr Public drives by get him and his daughter, or his sweetheart to come in and take a lesson After he has once mastered this 60-m.p.h plane so he can fly it around the field, and to and from the local airport he might buy one for a thousand or fifteen hundred dollars and use it until he really gets good By then he can step into a better stream-lined and more powerful ship and take his place among the real licensed aviators

This trainer cannot be a cheap plane with cast iron cylinders, cheap finish, exposed structure, and sloppy workmanship, but must have all of the finesse of finish and workmanship of a Swiss watch—a fifteen-thousand-dollar airplane which because of superior engineering and management, can sell for fifteen hundred dollars

After this is done one does not need to worry about a sales department, or the production arrangement, or the plane itself, for the amount of quantity you will turn through your shop will make up for all the deficiencies of cheaper cost in square wings outriggers, etc

The public has not reacted to our airplanes to date As a matter of fact they cannot react so long as these planes are so hard to fly that one must have a license to see if one can learn It is not the fault of the Government but of the planes and the engineers who design them So let's get busy and show the world and the public that we can give them what they want—safety, speed, quietness and low cost When we do that as engineers and merchandise it as business men instead of school boys, the day of the private aviator will be here

THE NEEDS OF THE PRIVATE OWNER AS I SEE THEM

By B. F. Castle
President, Great Lakes Aircraft Corporation

What are the actual merits of the product we are offering the public? Is there room for immediate improvement? If so, where should we begin, and how should we go about it? ¶In the accompanying article Mr. Castle gives his opinions regarding the kind of plane that the private owner wants, and should get.

It IS indeed an encouraging sign for the manufacturer of aircraft to feel the need of seriously considering the qualities which the private owner demands in a plane The question in the aircraft industry has prior to this year been largely theoretical Now it is very practical Private owners are becoming a factor in the sale of aircraft It would seem that the evolution of the automobile for sport, business, and recreation should furnish some criterion as to the probable evolution of the airplane with respect to the comforts and conveniences demanded by individual owners

The automobile of the early 1900's is remembered as a very crude affair It was noisy, it was dirty, it was dusty, its parts were inaccessible it was unreliable in performance and service stations for its repair and maintenance were few and far between Also, the roads over which it could travel were unfavorable to comfort

Where are we in the aviation field today with respect to the points indicated in the paragraph above? We certainly must admit that airplanes are noisy, that the open-cockpit type which seems to be the most pleasant for recreation and short business trips, is apt to be dirty, that the comfort of the pilot and his passengers leaves much to be desired, that landing fields which correspond to the roads required by the old-time automobile are few and far between, that the service stations are also not frequent and that their stock of spares is inadequate

The points just mentioned cover broadly comforts and service It is obvious that airplane manufacturers must give a great deal of consideration to the comfort of the users of their plane The idea of stuffing cotton in one's ears to keep out the racket is becoming rather obnoxious to the private owner flyer The dirt about an airport is most assuredly a nuisance

A few suggestions might be made of a general nature which will be helpful to those of us in the industry who wish to boost the progress of general use of planes by private owners These subjects require no elaboration but merely need be mentioned to bring them to the mind of manufacturers and thus insure that they will be discussed whenever the opportunity arises and remedied insofar as each individual manufacturer can provide a remedy The cost of maintenance is one of these, and high cost of insurance is another

The reduction in the cost of maintenance and, in general, service facilities, seems to be susceptible of achievement by the organization of many flying clubs throughout the United States It would appear that the development of golf clubs in the country may be a clue to what we must have in aviation One speaks with more confidence in view of the experience and success of the Aviation Country Club at Hicksville, Long Island, N Y Here service facilities, hangars, planes for building up time, flying checks and pleasant companionship of those who have like interests are available One can foresee the spread of such clubs and those of us who can help to organize them in our respective communities will be doing a constructive thing for the industry while meeting an obvious need of the private owner

We do not frequently consider the need for companionship in flying Advocates of the closed plane point out that this is one of their primary considerations and say that the open sport plane with its isolation of pilot and passenger is not conducive to pleasure The writer begs to suggest that an amelioration of this isolation can be achieved by the use of inter-communicating head sets

A matter which needs the attention of the entire industry is the excessive cost of accessories which now go with planes Plane manufacturers have made valiant efforts to reduce prices and in many cases have anticipated the expansion of the market in their cost reduction Accessory manufacturers have not apparently realized that they, too, must bear a part of this burden

The private owner in seeking to purchase his plane probably notes that practically every manufacturer advertises performance figures which seem contradictory when compared with actual performance of planes with engines of like horsepower, or even higher, and corresponding weight The industry should realize that nothing is to be gained by misrepresentation of plane performance Theoretical performance figures should be taboo in advertisements and in sales presentation

The private owner is the most important factor in the coming expansion of the aircraft industry If we foresee and anticipate his needs for comfort and service we shall hasten the day when a real outlet for sport planes will exist in this country.

THE RELATION BETWEEN PRIVATE AND GOVERNMENTAL FLYING

By David S. Ingalls
Assistant Secretary of the Navy for Aeronautics

THERE is no question but that a very important relation exists between private and governmental flying. Unfortunately there is at the present time very little private flying. Wherefore in establishing this relation we can be but theoretical.

The reason there is very little private flying at the present time lies in the fact that our federal government has had about all that it could do to develop and maintain our two military air services, the Army Air Corps and Naval Aviation and render indirect assistance to commercial aviation transportation companies. The government has, of course, entirely supported the military services, and while it has not perhaps subsidized it has in many ways indirectly assisted commercial flying. The Postal Department, through its air mail development, insures many an operator of a substantial regular income derived from the transportation of mails. And in addition to this the Army and Navy, by annual expenditures of large appropriations for new planes and the development of engines, planes and instruments, are providing an invaluable indirect assistance. When we realize that practically every material development in the art of aviation has been made directly or indirectly by the War and Navy Departments, and that with few exceptions and those very recently the success of commercial operation of aircraft has been dependent upon the assistance that it has obtained in one way or another from the government, it of course becomes obvious that but for our Federal participation there would be little if any aviation in our country today.

This support of aeronautics by the federal government is primarily for self-preservation, and secondarily in the interests of the development of a great new industry and a speedier system of transportation in our country.

Up to the present time then our country has done as much as it reasonably and practically could to further the development of this new science and to provide our country with this new weapon, limiting its activities of necessity to the military services and the commercial transport operators.

Into the realms of private flying, however, it has not gone. So far no practicable and reasonable method of rendering a more direct assistance to private flying than comes from the continued development of planes, engines and commercial operations has been evolved, although the importance of private flying is admitted. This importance lies in the fact that our government, just as any other government, is unable to maintain in peace times, because of the financial burden, an air force of a size that would supply our needs in times of war. In other words, we have but the skeleton of the framework upon which we must needs build in times of necessity. And to do that building we would like to have a great pool of private fliers and a number of manufacturers of private planes, for those pilots could be taken over and trained in the specialized military manner in a far shorter time than if it were necessary also to train the men in the art of flying itself. And the manufacturers building light commercial planes today could in a reasonably short time transfer their energies to the construction of our heavy fast military planes.

Although the government of the United States has never given direct assistance to private flying, most European nations and almost all of the British Dominions have done so. The usefulness of the private pilot and of the commercial industry as potential military factors have certainly been among the motives for their interest. Upon the relationship between private and military operation Secretary Ingalls speaks with almost unique authority. As a naval pilot of unsurpassed record during the war, as a private owner and enthusiastic operator of several years' standing, and finally as the official charged with supervising the administration of aviation for defense at sea, he has seen the problem from every point of view.

A Navy training plane on the runway at Hampton Roads Va.

Machine gun instruction at the Hampton Roads station

Unfortunately the military services are unable to count upon the commercial pilots for assistance in times of war, for undoubtedly the transport lines and therefore the pilots would be even more essential as such in times of war than they are in times of peace. In times of war almost everything is sacrificed to the securing of speed in military operations, and many more people and much more freight and express will be flown then in our country than would be at any other time. In the private flying field, however, there is truly a reservoir for our military services, for flying in times of war will be much as was motoring in the last war, something that is done as little as possible unless for military purposes. Private fliers would be invaluable to the Army and Navy even if they only replaced the ordinary commercial pilots and training instructors, setting the latter free to operate at the front.

SOMETHING has been done in this country to further private flying. We have the Aviation Country Club and the National Aeronautic Association endeavoring to help along. More and more is being done that offers encouragement. New air routes and air fields are being developed and maintained almost daily. Not only the federal government, but many of the states and many municipalities, are developing their own fields, lighting and marking them. The planes and the engines are every day a little bit safer, stronger, faster, and more comfortable, and most of all, cheaper. The cost of private flying is gradually approaching the point where it will be within the means of the average person.

In a general way, we may say then that aviation, because of the novel type of danger inherent in the art and because of the vast sums that are necessary to accomplish the continued development thereof, is a thing that has depended for its continued existence upon federal aid. It has been beyond the scope of development by individuals. Just how far that federal aid must go or just how far it is reasonably advisable for it to go in the expansion of private flying is a question that time alone will solve. Up to the present time it has not seemed in any way advisable for the federal government to support private flying as such directly. Certainly from the point of view of peace-time development there is no need, for if private flying cannot exist by itself with the many valuable indirect aids rendered through the development of the planes and engines, airports, and air routes, it would hardly seem worthwhile in any event. It would be an unhealthy and unnecessary growth, for as long as development of private flying in other countries does not reach a scope that would necessitate our entering this field, anticipated war-time needs of course will not be dominant.

But if and when private flying is an established fact in this country, its importance and its relation to our governmental aviation activities will become clear. That it will grow to considerable magnitude is the almost universal belief of the people of the aeronautical world, and there can be no question but that the relation between governmental and private flying will be of vital importance to our national welfare in the future.

TRAINING FOR THE SCHNEIDER TROPHY

By Flight Lieut. H. R. D. Waghorn

AFC RAF

On Sept. 12, 1929 the author piloted a Supermarine-Rolls Royce S. 6 over the measured course at Cowes, England at an average speed of 328.63 m.p.h. to win the 1929 Schneider Trophy contest and hang up a new world's airplane speed mark. ¶In the accompanying article he gives a most interesting account of what pilots do to train for such a high speed event.

A GREAT deal of sensational nonsense has been written about high speed flying, partly because sensation has its sale in the newspapers and partly because it is easy to imagine untold sensations in such a new category of speed These reporters are inclined to forget that we get our impression of speed chiefly by direct comparison with another object They forget that if you were to place an elderly business man in a machine (isolated from engine vibration) and take him through calm air at 400 m p h , he would have no more sensation of speed than if he were doing a mere 50 m p h This naturally assuming that he has been flown at a good height

I do not mean, by this, that speed flying has no sensation, because it very definitely has at any height below one hundred feet But where newspaper reporters invariably make their initial mistake is that they assume that the pilot is receiving a sort of Dempsey punch in the back all the time, due to acceleration in the forward path. This is very misleading to the man in the street, for even when the machine is accelerating and decelerating the force is hardly noticeable, while in steady level flight a man with his eyes shut in a high speed machine is as unconscious of his speed, as the man standing on the earth is unconscious of the earth's rotation

Some people have thought that the forward acceleration was so terrific that the head-rest was to prevent the pilots' breaking their necks on opening up the throttle Never a more misleading notion, because the drag of the floats damps out any terrific acceleration at slow speeds and the acceleration at high speeds is comparatively slow

When the late Flight Lieutenant Kinkead was killed, through his Supermarine's diving into the Solent when attempting the world speed record, many newspapers gave as a possible cause that the sudden deceleration of shutting the throttle made him fall forward on to the stick of the Supermarine-Napier S 5 , pushing it forward, and hence the machine nose-dived into the water. In my own mind I am perfectly convinced that nothing could have been less likely. I once had the engine of the Supermarine S 6 cut out through lack of petrol and although such a violent procedure made the engine whip in the fuselage, the deceleration was hardly noticeable. This was, without doubt, due to the perfect streamline of these high speed machines

Training for high speed flying requires a long period chiefly owing to the extraordinarily few times during the year that the weather is fit It is dependent on two main factors First, the strength of the wind and hence the all-important fact, the surface of the sea Second, the visibility But the first of these two conditions is what is likely to try the patience of the high speed pilot, for flying for him will only be possible when the sea is ideal The wind must be more than 5 m p h and not more than 15 m p h. Very rigid limits these, bounded as they are with a dead calm on the one hand and the slightest swell or white caps on the other

IF THE surface of the water is glassy it is dangerous as the pilot cannot judge his height in landing, and at the same time it is doubtful if any racing seaplane would leave the water if the surface were in this state The next stage in the categories of water fitness is an "oily" sea, and while it is possible to take off and land in these conditions, some racing floats show a great reluctance to leave the water The difference in behaviour of the Supermarine-Rolls Royce S 6 when she passed from an oily to a rippled patch of water was most interesting. I was once watching one of the team trying to take her off. The sea was oily and the machine obstinate She chased her tail and swung round in great circles, and it was obvious that she stoutly refused either to accelerate

on to her step or to stop this pronounced swing The pilot shouted over to us that he was "packing up" We had, however noticed a small patch of water in the distance which had the faintest ripple breaking its surface, so we got him to try once more The result was magical and he was off at the first attempt

Passing from "glassy," "oily" and "rippled" surfaces we come to the last surface on which high speed flying is possible, and this is "slight chop"

Provided that the chop is really very slight, you have, perhaps, the best surface for getting an obstinate machine off the water. Once the chop becomes noticeably whitecrested is usually time to stop any more flying. Any sign of swell prohibits high speed flying as well, since it tends to throw off before flying speed has been reached

From these remarks it will be obvious that the chance for a practice flight has to be snatched at the first sign of the right sea It may be at five in the morning or as late as nine in the evening. In fact, we generally got the best conditions at about these times, but the net result is that the practice is a long drawn out business, and pilots are liable to constant disappointment. In six months practice I had but twelve hours flying in high speed machines

THERE is no material difference between the handling of a seaplane and the handling of a landplane, but I found my first flight in a high speed seaplane a decided jump The whine of the fast revolving engine, the seemingly endless take off, with its attendant jolts and jars, which are magnified in some extraordinary way the difficulty of knowing what speed you are travelling at and the apparent magnification of any inaccuracy in flying, all helped in giving me a very vivid impression of my first flight in a high speed machine.

After a few flights, however, these peculiarities which had struck me so at first, began to fade away One very soon gets used to new sensations However, there is one very noticeable thing which I do remember struck me at the time That was how any feeling of acceleration is greatly exaggerated A very slight movement on the stick back and you feel as though you were being shoved through the seat, while if after a climb you inadvertently ease the stick forward too quickly you feel as if no straps on earth would hold you in

Anyone who has flown has experienced the feeling resulting from acceleration in a tight turn or loop If in such a case in a normal aeroplane, $3\frac{1}{2}$ g is the maximum that anyone would usually experience without feeling too uncomfortable it would as a rule need a heavy hand Such forces of g in a high speed machine are, however, produced by the slightest movement of the stick with the gentlest pressure It is then this force of gravity which is one of the most noticeable things about high speed flying If about 5 or 6 g are experienced in a sustained turn, there is quite the possibility of the pilot doing what is popularly known here as "going black" This is explained by the medical people as being due to the blood being drawn from behind the eyes back to the heart owing to centrifugal force The effect starts with a slight dimming, and if the experience is continued you lose your sight temporarily just so long as you are subjected to the acceleration It is as if a black film comes over the eyes The pilot does not lose consciousness, but it seemed to me that one lost one's quickness of thought, and if done repeatedly it had a decidedly weakening effect The way to produce the highest value of g is to pull the machine out of a dive, and although a pilot can withstand a higher acceleration g in this way because of its shortness of duration, it follows that a sustained condition of acceleration in a turn is the most difficult Different pilots can withstand varying values of g, differing as to their physical fitness and the way they are built Most of us seemed to "go black" between 6 and 7 g in a sustained turn

Closely connected with this force g is the all-important question "which type of turn is the most efficient?"—a question that is of the utmost importance for many valuable miles an hour can be lost through bad cornering The big climbing turn was ruled out from the start and had, in fact, been proved inefficient by the 1927 team Opinion between us differed, however, as to whether we should let the machine climb very slightly or keep dead level In banking a machine of this type, 'aileron drag' is so very pronounced that it needs a great force on the rudder to keep the machine from climbing during the first part of the turn Some of us thought that the extra drag involved during the use of the rudder would over weigh any benefit derived through keeping the machine completely level Hence

The winning team immediately after the 1929 Schneider Trophy Races. Left to right Flight Lieutenants D'Arcy Greig, Waghorn and Atcherley

... us decided not to ... the tendency of the machine to climb when turning (This must not be confused with the big type of climbing turn employed by the Italians in 1927)

Now we come to the more difficult question as to how tight or loose our turns should be In a fairly low speed aeroplane an efficient tight turn can be done with the stick back at such a position as to produce an acceleration of say, 3 g At 300 m p h the most efficient tight turn lay somewhere between 4 and 6 g If one did a tight turn one lost more speed and travelled a shorter distance and vice versa. In order to help us find this out, we had various self-recording instruments inserted in our machines which kept an automatic record of acceleration speed, climb, etc And by doing our turns over a carefully measured strip of coast we were able to find out —

(1) The diameter,
(2) g value at any point
(3) Time taken and speed of machine

From this data our X chasers evolved the perfect turn

Having decided on the type of turn which is to be employed the next thing is to give it as much trial as possible so that the pilots can get all the practice possible over the pylons High speed machines are constructed with extremely limited vision ahead In fact one can safely say that in the modern high speed seaplane, one is definitely blind dead ahead Hence it is that judging the correct moment to start the turn is a rather more difficult matter than may at first sight appear You have got to start the turn before the pylon is visible and you have got to judge it so that your radius is the correct length An example of the method that we employed during the last race will be the clearest way of explaining The Seaview turn was anchored, say a half mile from the beach By plotting our radius of turn on the chart and from previous practice we knew that we should have to leave the coast 400 yd on our right By aiming to do this we would arrive in approximately the right position when within about 200 yd of the pylon we could see it and we completed the turn with it in view This procedure is easy if one has shipping or land marks to help one but the case of the Cowes turn was an example of how difficult it could be.

First of all there was no landmark, as the approach to the pylon was in the middle of the Solent, and secondly there was very little shipping which was rather scattered making it hard to get the line In any case, during the first lap one is not used to the shipping and it is practically no help In subsequent laps, on the other hand it is of vital importance. Besides watching the shipping and landmarks there is something else which the pilot can do which helps immensely in finding the right line

As I have said before, while flying level, the view ahead is quite blind, but as soon as the machine is banking steeply the pilot can get a clear view down the course and if the leg is not too long he can see the next pylon This is an immense help and a very good reason why in any future race the authorities should pay particular attention to mounting the pylons on large ships In the distance the pilot cannot see the pylon itself, but he can see the boat the pylon is mounted on In the last race the pylons were mounted on destroyers It would be far better if in any future race the pylons could be mounted on Aircraft Carriers

In regard to the training of the pilots from the physical point of view, we took our training for the last race fairly free and easy The medical view was that so little high speed flying had been done that hard and fast rules could not be laid down Most of us did not drink in any case, but those that did abstained from alcohol The same applied to smoking except that in the case of the two members of the team that did, they cut it down to the minimum, but did not abstain altogether We kept fit by tennis and swimming, but had no special diet or physical exercises

This routine seemed to suit us admirably since we all kept perfectly fit and suffered no after effects whatsoever

Flt Lieut Waghorn taking off in the Supermarine S 6 to win the 1929 Schneider Trophy Race

LIMIT OF RACING POWER PLANT PERFORMANCE

A review of the progress of engine design with particular attention to those types used in racing airplanes.

By Lieut.-Col. L. F. R. Fell

D S O O B E M I Mech E F R Ae S

WHILE it is always dangerous to forecast quantitatively the ultimate limits to any engineering development, broadly speaking it may be stated that the limit of power output per unit of cylinder capacity has not yet been reached, despite the fact that when the performance figures of the 1929 Schneider Trophy winning Rolls-Royce "R" type engine are compared with those of present-day standard high performance aircraft engines, the results already obtained are truly remarkable This is illustrated by a curve, Fig. 1, of the progress made by the Rolls-Royce Company during the last fifteen years in this respect.

The horsepower of the Rolls Royce "R" engine obtained per square foot of frontal area—clearly one of the most important points to be considered in a racing machine—is shown compared graphically with present-day standard practice, and also with that of the last fifteen years in Fig. 2. The advance which has been made is perhaps even more clearly shown in the diagram, Fig. 3 which compares an engine produced in 1918 with the racing "R" ("Water-Cooled Aero Engines," by A J Rowledge, Royal Aeronautical Society, July 30) the latter being capable of giving nearly four times the normal power of the former In this respect further improvement will be automatic with increase in horse power from a given cubic capacity

The improvement affected in the racing engine so far as weight per horse power is concerned is perhaps not so striking as the foregoing, and it seems likely that there is not much more to be done in this direction, as it will almost certainly be necessary to increase bearing areas, and, in consequence, overall length of the engine in order to enable working parts to stand up to the increased output still to be obtained from the cylinders

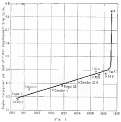


Fig 1

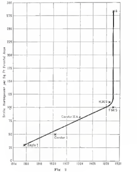


Fig 2

To complete the series a curve is included, Fig. 4, comparing the racing engine with standard engines of the past and present on a weight basis

TURNING now to the limiting factors in racing power plant performance the foremost obstacle which has to be surmounted before any marked advance in performance can be obtained is dissipation of the waste heat given up to the water by the engine In the Supermarine S 6 Seaplane, which won the Schneider Trophy in 1929 and holds the world's air speed record, the inner and outer surfaces of the plane were used as water coolers This surface was found to be inadequate to deal with the enormous quantity of heat which had to be got rid of from the Rolls-Royce "R" type engines giving 1900 hp. and in order to improve the situation a large proportion of the surface of the floats was

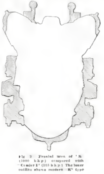


Fig 3 Frontal area of "R" (1900 b h p) compared with "Condor I" (525 b h p) The inner outline shows modern "R" type

pressed into service as additional water cooling surface Even then it was found impossible to open the throttles of the engines to the fullest extent The sides of the fuselage and also the fin were already in use as oil coolers, and proved adequate for this purpose

If the whole of the available surface of the S 6 machine were to be utilized as radiating surface either for water cooling or steam condensing, it is possible that perhaps 20 per cent more power could be dealt with, taking into consideration the increase in forward speed of the machine which would result from this increase of power and the consequent advance in the rate of heat dissipation from the cooling surfaces

As already indicated, judging from the result of bench tests and the successful running of the "R" engine in flight trials for the Schneider Trophy of 1929, there seems to be no reason to anticipate that the engine builder has yet reached the absolute limit of power output, and some other means of dealing with the waste heat dissipation without increasing the head resistance or drag of the aircraft must be sought if possible power increases are to be used advantageously

The supporters of ethylene glycol cooling will say that they have the solution to this problem. They will state that the increase in boiling point of this liquid—providing as it does a wider temperature difference between that of the atmosphere and that of the cooling surface—will give a greater rate of heat dissipation, and thus obviate the necessity of providing additional surface Here however, a difficulty arises It has been shown by Professor Gibson, of Manchester University that when using water as a cooling medium the temperature of the metal of the cylinder wall, or crown rises with increase of water temperature up to about 70 deg C, but is not increased by advancing the temperature of the water from 70 to 100 deg centigrade Professor Gibson shows this to be due to the formation of steam on the surface accelerating the rate of heat extraction thus compensating for the increase in temperature It is clear therefore, that if a liquid with a high boiling point is substituted, the temperature of the cylinder wall will rise with the temperature of the cooling medium until the boiling point is again nearly reached, when the same phenomenon should occur

It has been demonstrated both on experimental single cylinders and also on the complete racing engine that the power output obtainable from a given capacity is very greatly affected by the temperature of the material forming the combustion chamber surface, the power falling off due to detonation with comparatively small increase in temperature

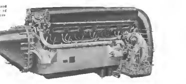
It is interesting to note that ethylene glycol was actually tried on the Rolls Royce "R" engine, but it was found necessary to decrease the power due to the higher wall temperatures, thus offsetting the advantage to be gained from the reduced radiating surface which would have been possible from the use of ethylene glycol

It will be gathered from the above that it is the tendency of an engine to detonate which limits the maximum output for racing work, and here the assistance of the chemist in the production of anti detonating fuels and dopes is of vital importance Probably still the most important discovery in this connection is tetra ethyl lead and the most satisfactory fuel so far discovered to give the best all round results as regards anti-detonating properties, and also low specific consumption, is a light petrol plus a high percentage of benzol, plus a high concentration of t e l, the latter being limited only by what the spark plugs will stand without suffering from the effects of lead deposit

ALCOHOL fuels have not been found suitable for air racing work owing to their low specific heat value, and the consequently large quantities which it would he necessary to carry, which would be beyond the capacity of a racing aircraft It must be remembered that the Rolls-Royce "R" engine was consuming petrol at the rate of two gallons a minute during the race, and even at that the total fuel capacity of the macchine was exhausted in three quarters of a lap over and above the seven comprising the Schneider Trophy Course in 1929

The tendency to detonate, as has been stated, is affected by cylinder wall temperature While the water-cooled poppet valve engine insures that all the jacketed portions of the combustion chamber are working under favorable conditions, there are still the exhaust valve heads themselves which are of necessity at a consider-

The Rolls-Royce "R" engine used in the Supermarine S 6, winner of the 1929 Schneider Cup Races



ably higher temperature than the rest of the combustion chamber surface While it is certain that with special fuels and further research work the poppet valve engine is capable of still greater increase in power output, it seems likely that the presence of the somewhat inadequately cooled exhaust valve heads will ultimately prevent further progress

WERE it possible to eliminate these valves, there seems little doubt that enormously increased output can be obtained from the water cooled engine A line of development to meet this difficulty has been explored experimentally for many years, viz, the use of the sleeve valve Work recently carried through at the laboratories of Messrs Ricardo and Co, Ltd, of Shoreham England, ("The Development and Progress of the Aero Engine," by H R Ricardo, Eighteenth Wilbur-Wright Memorial Lecture) with single sleeve valve engines of the Burt type has shown that on a single cylinder unit

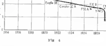


Fig 4

brake mean effective pressures of double those used in the Rolls-Royce "R" engine in the 1929 Schneider Trophy Contest are possible, even when using standard aviation fuel as supplied to the Royal Air Force. If a fuel similar to that used in the 1929 Schneider Trophy Contest is substituted, this same single cylinder unit will maintain a brake mean effective pressure of 550 lb per sq in

It will be appreciated that in order to obtain these high brake mean effective pressures a very high degree of supercharge is employed though to obtain such high boost pressures would not seem to present any particular difficulty so far as the design of a practical complete engine is concerned Doubtless many other difficulties unforseen at the moment would have to be overcome before a successful sleeve valve racing engine was produced

In considering the use of the very high supercharges referred to in the previous paragraph it must be remembered that permissible specific fuel consumption is strictly limited by the amount of fuel which it is possible to carry without unduly increasing the total weight of the racing aircraft. A very high supercharge is in a normal four stroke engine, of course accompanied by a high exhaust pressure with loss of expansion and consequent waste of energy

In designing the rolls-Royce "R" engine a limit was placed by the aircraft designer upon fuel consumption and it was necessary to keep this very closely in mind throughout the experimental work to secure the correct balance between boost pressure and compression ratio so as to insure that the maximum horse power was obtained without exceeding the specified consumption This limitation will prevent advantage being taken of the use of the very high brake mean effective pressures referred to above as being possible with the single sleeve valve engine It is clear however that brake mean effective pressures somewhere between what has been employed in the Rolls-Royce "R" engine and what has been experimentally obtained on the single sleeve valve cylinder are feasible

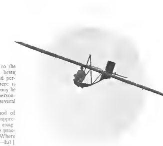
TO SUM up, therefore, it would seem that the designers of the water cooled aircraft engine are still far from the ultimate achievement possible from an engine of a given cross-sectional area By taking advantage of the latest metallurgical developments such as the use of hardened bearing surfaces and improved bearing materials higher rotational speeds than those at present employed are possible and increased maximum pressures are feasible, the latter permitting of still higher compression, both in the supercharger and in the cylinder itself with consequent increase in output for a given capacity There has at present been discovered no insuperable difficulty in obtaining adequate heat extraction from the cylinder surfaces by the cooling medium, thus establishing the ascendency of water-cooling over direct cooling, where this limitation is the controlling factor in air-cooled engine design. The difficulty of providing both adequate and efficient heat dissipating surfaces in the aircraft itself is, however, a very real one.

THE GLIDER

AND THE AVIATION INDUSTRY

By Donald F. Walker

Manager National Glider Association



Paul Skeels of the Chicago Gliding School going into a left bank

The glider movement in the United States has been the beneficiary of energetic propaganda carried on by the National Glider Association and various other interested bodies. Upon the future course of that propaganda, upon whether or not it should be financially supported, and if so how, the aircraft industry has obviously been questioning itself in recent months. Mr. Walker, who has been active manager of the work of the National Glider Association during the past year, has undertaken to set the problem forth frankly, with the benefits and the hazards of glider operation.

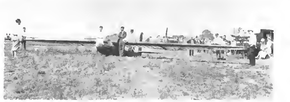
OF JUST what significance is the glider to the aviation industry? This question is still being asked on all sides by men and women deeply and personally interested in American aeronautics There is no simple answer to the question If any answer may be made at all, it must be made dispassionately, impersonally, and with some effort to gauge the value of several important factors

The value of gliding and soaring as a method of training future motored airplane pilots is fully appreciated in Germany despite the fact that certain exaggerations have been unintentionally made as to the practical applications of that appreciation [See "Where Stands the Glider?" in AVIATION for August—Ed] The German takes it for granted that there is value in teaching a young man or women the use of the controls in a simple motorless airplane costing about one-tenth to one-fifth the price of a motored airplane He also most emphatically points out the value of soaring flight, not only as basic training for motored airplane pilots but as "post graduate" training for pilots having hundreds of hours in the air.

Your German takes primary glider training for granted, just as teaching a youngster to read or write is taken for granted throughout the civilized world Taking that for granted, he endeavors to get as many as possible to take the soaring training which he regards, quite properly, as an essential for that man or woman who would be truly educated either as an aeronautical engineer or pilot Quoting the "Aircraft Year Book" 1929 of the Aeronautical Chamber of Commerce (Page 278)

"Other appropriations made by the federal government (the Reich) in its aviation budget (1929) included . . . . glider development, $108,000, . . ." This compares with the item of $332,000 for navigation aids and airport wireless stations, $380,000 for the German Aeronautics Experimental Institute, etc , and gives some idea of the importance with which the German government regards the glider movement This is of course in addition to contributions and prizes offered by German individuals and corporations and the regular income from popular sources of the Rhoen-Rossitten Society.

When the expenditures of the German government and aeronautical industry are compared with similar resources in the United States the $52,000 spent on the development of American gliding since 1928 by the



The Akron Comber flown in 1929 for American cross-country and altitude records under auspices of the N G A

National Glider Association without any form of government subsidy and largely through the gifts of one citizen, Mr Edward S Evans of Detroit, it is truly remarkable that any progress has been made in this country at all

There has been great difficulty in co-ordinating the American glider movement sufficiently to define clearly and by mutual consent just what is the goal. The N G A itself announced in the fall of 1929 that if the industry would place at its disposal the sum of $100,000 a year for three consecutive years, it would so conduct and guide the national movement that by 1935 there would be 1,000,000 Americans trained to the point where they could qualify for the so-called "Third-class License" requiring a flight from a height, shock-cord, of thirty seconds with a good take off and satisfactory landing. Less than one-tenth of that sum has so far been placed at the disposal of the association, and its program has been correspondingly crippled

The look-out tower at the meteorological station of Dr W Klemperer, Uniontown, Pa Radio in automobile brings weather reports every half-hour Balloon reading comes six times a day from Burgess Field about six miles away

In the first place, the goal was frequently described as grossly exaggerated But when one considers that there are approximately 20,000,000 persons allegedly able to drive automobiles in the United States thru our congested traffic it would not seem unreasonable to assume that if they so desired, that five per cent of that number could fly a little glider thirty seconds down hill, particularly when the cost of training and flying all told does not have to exceed $50 per person for the purpose and can be made far less

In the second place, business conditions since the Fall of 1929 have not been of a nature to encourage Boards of Directors to apparently "give away" money when some of the companies have creditors of their own at the very doors

On the other hand, there has been another factor in the failure of the industry to do its duty to itself either through the N G A or any other medium that might be selected for the work, and that is a marked tendency "to let George do it," which in this particular instance might be paraphrased into "letting Mr Evans do it"

Obviously, for good or ill, the national glider movement is too big a load for any individual There still exists a disposition to feel that "someone will do something about it"

The truth of the matter is that "someone" as usual is doing nothing about it and a great opportunity is going by default It must be remembered that five per cent of those auto drivers can become glider pilots *if they so desire* Someone or some organization working nationally must stimulate that desire, through advertising and propaganda, someone must be prepared to answer the thousand and one questions of that local individual or group desiring information on "how to start," and someone must keep in touch with each group that starts, to see that it is given every possible encouragement to continue. The local group is hardly able to pay the central agency much more than the actual cost of furnishing them with essential aid, so that the cost of overhead and educational work must be borne by the industry or the work cannot be done. That is the truth of the situation and it must be faced and at once If there has been any slack in the growing glider movement, it has been due directly to lack of funds to carry on, improve and extend the educational work

Glider Accidents

ANOTHER disturbing factor has been the far higher death rate in American gliding, as compared for instance with German gliding A certain increase in the

rate might be expected due to difference in discipline and temperament of the nationals concerned But that will not explain away the situation entirely The basic reason is that interest in the subject among the people out-grew the educational campaign, so that only too

Gliding in Michigan in the winter season

many jumped into the new game without adequate training. Many motored airplane pilots took it up as a fad and game, too lightly assuming that they could fly anything that came along without training or thought They have paid for their error with their lives

But you ask, if a fifteen-year-old youngster can be *safely* taught to glide, why cannot a transport pilot teach himself safely He can Unfortunately some of them do not take the trouble to teach themselves, but simply hop off without giving the matter any thought at all There are any number of young men in glider centers like Detroit and Akron who never have flown a powered ship in their lives, who could warn transport pilots that they are risking their lives with their foolish stunts The youngsters are safe because to start with they *know* they do *not know* and go to great trouble to *learn* With them, the danger comes with about the third to fifth flight, when they *think* they know That is why instructors, often volunteers, are needed to watch them carefully at this period

The American glider movement is quite different in its goal (as commonly interpreted) from the German and English movement The latter take primary training for granted and specialize on soaring flight. In America we have undertaken to popularize the sports beyond the fondest dreams of our European friends We plan to carry practical flying to the people on an enormous scale It is possible and practical to do this if we do not fly off on too many tangents

Already there is a tendency to hurdle some of the essential steps Starting with a normal abhorrence to unnecessary labor, the tried shock-cord launching method, beyond argument the most fool-proof method of getting a glider into the air, is being supplanted with special devices to reduce the labor The rubber is extended by auto, special automatic releases take the place of the tail-crew, and in large plain areas only auto towing is used This latter is, under proper guidance, the most efficient method of primary training but can be easily prostituted into a terrific hazard

American airplane towing largely originated in the desire of the Franklin Brothers to find a method of transporting their big secondary gliders 'cross country other than by taking them down, loading them on a trailer driving through the country to their destination and re-assembling them for the demonstration, contest, etc In their hands, this proved a tremendous success In the hands of thoughtless individuals on the Pacific coast, it cost two lives and forced drastic regulation by the Department of Commerce Since then Captain Frank Hawks has demonstrated by a trans-continental tow that it can be done safely and efficiently and that in addition that it opens many unusual opportunities for advanced soaring flight

"Power Glider" Problems

Then we came to head of "powered gliders" Because it superficially resembles a glider, a very successful ship, described by its designer as a "light airplane" has been widely heralded in the press as a "power glider" Actual gliders, some of them close relatives of the efficient primary, have been equipped with motors What is the result? A very deluge of inquiries at N G A headquarters regarding the installation of engines on gliders by young and inexperienced persons who are

An N G A show window display as part of an educational campaign

not yet ready for advanced glider ratings, and certainly not for powered licenses Unfortunately, a few take a chance and get by That encourages others to do so Just what happened in auto-towing is likely to be repeated in so-called "power gliders," and a Roman holiday follow How can this be prevented? Partly by regulation, yes, but more efficiently and far more cheaply by education

Glider enthusiasts are not opposed to the design and production of very light, economical and efficient air planes They desire that development so that when they have mastered the motorless craft they can go on to the motored at a price within their means, but they do feel that each type should be carefully defined as to the special ability required to design, build and fly

The take-off Note the shock cord falling away from the glider

The so-called "motor gliders" in America, have little resemblance to the "Auxiliary motored soarers" of Germany These are sail-planes, launched by shock-cord, but equipped with a small efficient auxiliary motor which when used by a master pilot will enable him to stay in the air for hours exploring new soaring terrain and conditions They are most delicate craft and certainly not intended for beginners

One result of introducing these labor-saving devices into American gliding has been, as we have seen, the approximation of powered flight The glider kiting behind an auto is a powered ship up to the point where it is released. Too quickly the beginner gets into the zone, psychologically, of powered flying; too quickly he loses interest in the fine points of motorless flying, including that acme of all flying, soaring flight

Soaring Possibilities

This is very much to be regretted and the tendency should be firmly resisted by all true and intelligent friends of American aviation, motorless or motored "Haste makes waste," and in aviation it may cause deaths In this case, it does another thing not yet appreciated very fully in the United States It deprives the pilot of the pure fun and enjoyment of staying in the air for minutes and hours, of going hither and yon with no means of support but natural up-currents of air

Mr Air-line Operator, what would it mean to the safety of your equipment and your passengers to have at the stick of your transport ship a man who has deliberately played with storms in a ship with no motor at all? The Germans are loud in their testimony in favor of soaring

"But where can we soar?" has been the cry of the American glider pilots, "without going great distances at great cost?"

Slowly but surely despite lack of encouragement, the N G A and its members are discovering spots scattered across the country for the purpose Cape Cod and San Diego are well known All of the Pacific Coast must be good Successful soaring flight has been approximated if not actually made by the American official champion, William H Bowlus, at Montauk Point within a hundred miles of New York City Within recent weeks, he flew for fifteen minutes at Ludington, Michigan This summer, O'Meara of Akron flew twice for over an hour each time on the terrain at Elmira, N Y selected by Dr Klemperer for the national soaring contest of 1930—assuming that funds can be provided to hold such a contest at all Klemperer has soared after blimp launching between Akron and Cleveland and by shock-cord at Uniontown, Pa The Wrights long ago soared at Kitty Hawk, N C Hawks, airplane towed, soared in Arizona, Texas and at Syracuse, N Y, the latter demonstration being comparable with the work of Kegel, Nehring, and Kronfeld in Germany We have places to soar Just give us money and men to develop them

The National Glider Association has received the moral support many times of the National Aeronautic Association and the Aeronautical Chamber of Commerce. It has been aided materially by a few of the leading individuals and corporations in the industry It is not controlled by any one with a desire to dictate the lines along which the movement should be encouraged to grow

A great conference on the subject, sponsored by the Chamber of Commerce, the N G A., and the N A A., jointly, should be held immediately to iron out any problems that may be broached by members of the industry and to establish and approve a definite policy, an inclusive and effective plan of operation and a dependable method of financing The movement is too important to be allowed to drift without fuel to supply the engines of progress

PRIVATE FLYING IN CANADA

By Francis W. Rowse

Aviation Editor, Ottawa Journal
Ottawa, Canada

Lower left: Maj Gen J H MacBrien C.B. C.M.G., D.S.O. Above: J A Wilson Comptroller of Civil Aviation in Canada

THE Britisher of the "public school" type, has always turned with characteristic thoroughness, amounting almost to a passion, to those sports of his class which not only provided an intellectual and physical stimulus but maintained his social status Thus, in former days yachting, polo, "rugger" and kindred outdoor pursuits found the flower of British chivalry on the playing field When the Great War offered aviation as an avenue of expression of patriotic sentiment, as well as providing a challenge to young minds and bodies, young Britain went into the air in thousands Many of the finest youngsters of the day received their first taste of flying in the War, and they brought it back to civilian life with them—those who survived Today flying ranks even ahead of polo and cricket as a means of diversion for the spirited young man of means.

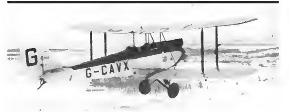
During the Great War, too, many young Canadians earned their wings. The youngsters from British North America were found to make excellent pilots and only the names of such men as the late Wing-Commander Barker, Colonel Bishop, and Collishaw, need be mentioned to testify to the splendid work they did

Like their kindred overseas, the Canadian young men of substance quickly turned to aviation as a sport The same class of citizens who discarded their polo ponies on old country estates for trim biplanes, in Canada are enlisting in their hundreds and thousands in flying schools, flying clubs and aviation services of all kinds Some of them are turning to aviation as a means of livelihood, but the great majority, in this class of the community, see the airplane merely as the means of thrilling sport, having many advantages over other competitive pastimes, and placing them in undisputed possession of social and financial security

Probably in no country in the world, not even in England, where most of the early private flyers earned their wings has flying as a sport taken such a hold on popular fancy Today here are actually thousands of young men struggling with the intricacies of aerial navigation, and sweating over the mechanical features of aviation in an effort to qualify for the ranks of the "flying public"—those romantic individuals who have the means, the taste, and the ability to get them into the air on every desired occasion

There has been a striking measure of success in Canada in teaching young men to fly, and something of a unique system of training has been inaugurated and supported by the federal government, quick to grasp the value of a trained air personnel

WITH an undefended international border of 3,000 miles giving the lie to "preparedness" advocates and French speaking Canada still smarting under war-time conscription, things military have had a bad odor in Canada since the Armistice and the return to their own shores of the men of the Canadian Expeditionary Force But for the challenge aviation has given to the virile young manhood of the Dominion, it is safe to guess that the Department of National Defense would be merely an adjunct of some other branch of government—possibly a Colonization and Development department—instead of the large, highly-organized service of Dominion government that it has developed into since the War The Department of National Defense, in short, is largely a department of commercial aviation Canada now leads the world in aerial survey and aerial photographic work as well as in several other useful phases of aviation But without the stimulus of the British sporting instinct it is plain that private flying would be



A Canadian private pilot on a winter time flight in a D. H. Moth

still in its infancy, and the privately-owned, privately-flown aircraft would be practically unknown in the great Dominion to the north of the United States

As it is, a chain of airports has been strung across the continent, many of them in parts of the Dominion barely accessible by means other than flying machines At the same time healthy private flying organizations have sprung up all over the country, and millions of dollars yearly are being laid out in the provision, maintenance and operation of aerial fleets for training and pleasure purposes for young men, and women, too, who have no object other than to learn to fly, for personal entertainment and advancement

Canada was fortunate indeed in having the nucleus of a splendid corps of trained flying men and organizers and managers when she went into aviation with the national viewpoint of a sports loving, adventurous people There were men in her government air service with wide war-time and peace-time experience ably fitting them for the control and regulation of private flying Headed by J A Wilson, Controller of Civil Aviation, a large branch has been created under the Department of National Defense for the management of the government relations to the flying organizations in which the young flying aspirant is nursed at the controls of the airplane, and the "landlubber" of the day is being made into the private pilot of the morrow

Statistics can tell a great deal about the peogress of private flying, and a generous compilation is given in "Flying Clubs and Private Flying" printed elsewhere in this issue. However, they do not express the spirit that animates the pilot or private owner. In building the future of the industry, we want to know not only how much people fly but why, and what kind of people they are. Mr. Rowse undertakes to peovide that information for the Dominion of Canada, where private flying through light airplane clubs has flourished.

UNDER Mr Wilson, and actively engaged in the development of commercial and private flying as distinct from governmental services, are such experienced aviators as Squadron Leader A T N Cowley and Squadron-Leader J H Tudhope, respectively Superintendents of Air Regulations and Airports, and a corps of highly-trained inspectors, located at Ottawa and at other important centers, to keep their fingers on the pulse of private flying

An able assistant to the government in the development of private flying, has been the Aviation League of Canada, which was organized by, and is under the chairmanship of, Maj.-Gen J. H MacBrien, C.B., C.M.G., D.S.O., of Ottawa General MacBrien was formerly Chief of Staff of the Department of National Defense He was primarily concerned in the building up and maintenance of militia forces of the Dominion, but was always keen on aviation, and never neglected an opportunity to advance this phase of his department's development

Every year, since his League was formed to sponsor the development of private flying in Canada, General MacBrien has gone about the country, flying solo in his Moth, speaking words of encouragement and cheer to his fellow countrymen who have the same devotion to aviation and the same confidence in its future that he possesses His efforts in the encouragement of private flying were preceded by several important events in Canadian aviation history which have done a great deal in the creation of an airmindedness in the general public and particularly among young university men and others of fairly substantial means who have been able to take practical interest in flying

In 1919, the first non-stop Atlantic airplane flight was made by the British team of Alcock and Brown Al-

though neither the start nor the finish of the flight was in Canadian territory, it attracted a great deal of public notice, and, coming on the top of the already strong air sentiment aroused in Canadians by war-time flying, did a great deal to aid the launching of the first flying clubs.

These, formed in Montreal shortly after the crossing of Alcock and Brown, were merely branches of flying organizations in Great Britain. Such men as W. D. Lighthall, of Montreal, occupied themselves actively in the launching of private clubs, and they were a great success. Unfortunately, however, they were of necessity restricted in membership to the wealthy few in the big centers of population, and had by no means the nation-wide endorsement and understanding which assists the flying clubs as now organized.

ONE of the finest examples of private flying in Canada took place in 1926, and was afforded by a wealthy Pittsburgh man, J. Dalzell McKee. Mr. McKee, although an American, became Canada's first genuine patron of private flying, and today his memory is held in esteem by all flying people in the Dominion.

It was Mr. McKee who carried out the first trans-Canada seaplane flight. In this exploit he was accompanied by Squadron-Leader A. F. Godfrey, who still, as Superintendent of Flying Operations of the Civil Government Air Operations Branch, Department of National Defense, plays an important part in Canadian aeronautics.

In recognition of the splendid assistance given him in his flight by the government air services, and by flying organizations throughout the Dominion, Mr. McKee gave Canada a handsome trophy, to be awarded annually to the pilot or other person connected with the country's aviation considered to have rendered the best public service in this field.

Most unfortunately Mr. McKee came to his death soon after the brilliant termination of his trans-Canada flight. He was killed, as he probably would have chosen himself, in a flying accident. In recognition of the spirit in which he donated his trophy, however, and in the belief that his example will always stand before Canadian flying men as an incentive for development of private flying, the Department of National Defense is still carrying on the McKee award annually. The McKee Trans-Canada Trophy is the big prize for flying in Canada each year. It is a striking fact that in each of the three years in which it has been awarded it has gone to a pilot living and flying in Western Canada.

Such shining examples as Mr. McKee's were held out to the Canadian people by General MacBrien in 1926 and 1927 when he made a long lecture tour throughout Canada urging a more intense public interest in aviation. His eloquence bore fruit. In 1927 the Canadian government, following the British example but acting quite independently, offered special bonuses in the way of free grants of aircraft, payment for men taught to fly, etc., to clubs which should organize themselves around a nucleus of war-time or already-trained pilots. Many Canadian centers quickly took advantage of this offer, and in various cities groups of men who previously had found flying costs beyond their means banded themselves together into clubs.

Even Canadian women took a keen interest in the work of the clubs, and it was not long before the latest in feminine flying apparel was to be seen on Canadian airports. At the present time there are nineteen women in Canada holding private pilot's licenses, three who have qualified as commercial pilots.

The actual number of members of flying clubs, about 80 per cent of whom are actually learning to fly, and have reached various stages of proficiency in the art, varies considerably from month to month, but it is estimated that from 3,000 to 5,000 young Canadians are identified with these organizations, through the medium of which most of the private flying is carried on.

The proportion of successful pupils turned out by the clubs is increasing, as is the number of new pilots each year. The flying club plan bids fair to provide a large percentage of the flying population of the country.

Flying club members are most enthusiastic about the work on which they are engaged. The fact that it is possible to obtain sufficient training and practice to pass the private pilots' tests in about 10 hours, is an attraction for the young man who could not afford an aircraft of his own. Some of the clubs have cut their operating rates in such a way that it has been possible to charge as little as $12 dual and $8 solo per hour for members, with a reduced rate for those who have obtained their licenses and are flying merely for pleasure and to keep in practice. Each year, and sometimes more often, the clubs hold field days, when they vie with one another in races and stunts. Inter-club meets are held, and sometimes the flying organizations set out with fleets of 'planes to take part in meets far afield.

No less than 12 aircraft flew in formation from the Toronto flying club to Selfridge Field, Michigan, to take part in a special event staged there. The visit created as much enthusiasm in Toronto, where it was organized, as it did at the scene of the sports, where the Canadian visitors gave an inspiring demonstration of their country's air mindedness.

Planes often go further afield on expeditions and pleasure trips. As most of the aircraft used at the clubs are merely on loan by the Department of National Defense, rules are in force restricting the distance 'planes must go beyond their home fields, but this has not prevented the private owners associated with the clubs from carrying out long and adventurous flights into the mountains.

UNDOUBTEDLY one of the chief advantages the flying clubs have given Canada has been the provision of splendid flying fields in many important sections of the country. Some of these fields rank high among the Dominion's airports, governmental and otherwise. In most cases airports are within easy reach of the cities.

Since flying is still mainly the sport of the well-to-do, despite all governmental aids to training, the social side of the clubs' activities is not overlooked. Spacious club rooms are being built, hangars often provide space for dances, and the airports near cities provide community centers which bid fair to rival the country clubs.

Private owners as a class maintain a splendid esprit de corps. Recently a private owner at Whitby, Ont., whose wife is also keenly interested in flying, staged an "aerial garden party," and early in the afternoon set aside for the event, a long line of aircraft of all designs, some of them flown from considerable distance, were lined up on the spacious lawns of the host's estate. [Such private social meetings have been relatively common in England, but practically unknown in the United States. —Ed.] It was an event which it is hoped to make annual, and which will no doubt be only one of many such parties in the history of private flying in Canada.

AS ONE PILOT TO ANOTHER

By Merrill C. Meigs

It has been fashionable to talk of flying as the business of the younger generation, and to consider the business man who takes it up after passing his fortieth birthday as a bit of an oddity. At least it is often supposed, and even by people in the aeronautical industry, that he will be limited to a very modest degree of competence and to a very limited range of piloting activities. That it need not be so, the record of the author of this article attests. Mr. Meigs, publisher of the Chicago Herald and Examiner for several years, made his first flight at the age of forty-five, and has recently received his transport license. He writes of flying not as a pursuit for a few but as a pastime for responsible businessmen.

THERE has been so much written on the subject of aviation from every conceivable standpoint that I hesitate to try to add anything further. Perhaps the only excuse I have for writing at all is the fact that I am one of the few men who undertook to learn to fly after the age of forty and who has passed the Department of Commerce examination for a transport pilot's license.

The author at the controls of his plane ready to take the air

Most business men of my acquaintance cannot understand why a man with some gray in his hair should want to fly an airplane. Their apathetic attitude on aviation and their ignorance of the subject makes them feel that a man is taking his very life in his hands when he takes up flying. To correct this erroneous attitude (in a good many cases by taking the skeptic for his first airplane ride) has perhaps been the greatest pleasure and satisfaction I have derived from learning to fly. However, while I have convinced a few, the great majority still remain unsold and will not believe facts and figures regarding the safety of aviation today. Furthermore they fall back on the old contention that it is a young man's game—a hazardous sport of adventurous and daring youth. I think my experience is a demonstration that this is not true. I believe that any man who can pass the Department of Commerce physical examination and who has fairly good co-ordination and sanity (although some feel that the latter isn't necessary and is oftentimes lacking) can learn to fly irrespective of his age. Frankly, I believe an older pilot has an advantage over a younger man because he will be more conservative in his flying and will not do the things which the rules of safety forbid. In some 210 hr. of solo flying during the past three years, I have never been even close to the danger line. To me the line of demarcation between safety and danger in aviation is so apparent that one need never even approach it.

Let me outline some of the points which a private flier, or any flier other than an expert, or one who has to go through for some special reason, should consider:

1. The type and condition of the airplane in which he is to take his training, also the reliability and experience of his instructor. I believe that the old conservative flier is a much better teacher than a younger flier. He is likely to have had more experience and have impressed on him the points of importance so that he, in turn, will more thoroughly impress them on the student. Then, too, it is quite likely that he will be more particular about the condition of the airplane which he flies. Minute inspection following strictly the Department of Commerce rules is the prime requisite to safety, yet I know that many fliers disregard these rules and fly a plane continuously day after day without any kind of inspection. It is true that they "get away with it" but some day they won't, and then it will be another "black eye" for aviation.

2. Weather. With the adequate weather reports available now there is no excuse for a pilot to leave the ground unless he gets a weather report covering the territory to be flown. When there is any doubt expressed by the weather man, as there sometimes is, a flier should, in the interest of safety, simply cancel the trip. A safe and sane pilot, having already started on a trip and find-

ing bad weather ahead will either land in an emergency field or turn back to the nearest airport He will not take a chance flying through in the hope that the weather will not be too thick or rough for safety, yet many pilots brag about how they got through this or that storm Headlines in this morning's paper are as follows "Two flyers killed as airplane plunges into lake" The pilot, according to the story, was an old, experienced flier but he tried to go through fog over Lake Michigan "Maybe I can get through" has caused more accidents in aviation than any other one thing

3 Landing Fields First, know your ship and its limitations with different loads, and then keep well within the limitations If you have landed in a field that is softer than you expected and there is some question about getting out safely, then stay over until there is sufficient wind to get you off or take the plane down and haul it to a field that is adequate. This might well apply not only to emergency fields but also to some of the small country town fields which have low rating as airports It doesn't take very long to walk over such fields testing them for hardness of the turf and for rough spots and mud holes, yet the careless pilot will frequently take off without taking this precaution

4 Conservative operation of the plane in the air A successful pilot knows that he has no business to pull a plane into a steep climb on the take-off He knows also that making short turns right on the ground is unsafe Furthermore, he knows that acrobatics are dangerous only when they are performed at low altitude, and still

Above Do this only at high altitudes Below Towing a private Moth with wings folded in the take off position

the boys take tremendous chances too near the ground To sum it all up, it seems that private pilots can be of inestimable help to the industry by constantly practicing and advocating the four points which I have outlined above, namely: (1) the proper care and condition of the plane, (2) avoidance of bad weather; (3) knowing the conditions of landing fields; (4) conservative air work

There would be far fewer airplane accidents if every pilot would ask himself, before disregarding any one of the above points, "Am I absolutely sure?" and if even slightly dubious, wait until doubt disappears.

ONE more point, in closing There is too much talk about the ease of learning to fly I have heard pilots say it is almost as simple as learning to drive a car We who remember those first three or four hours of instruction know that there is a vast difference between the two Why not be frank about it and state facts? Namely while it is not difficult to learn to fly it takes a good deal more time and application than is necessary to learn to drive a car Furthermore, it takes several weeks of instruction before the average student may safely fly his plane home cross country Stating facts as we know them will be far more beneficial to the flying industry than will understating actual conditions A case in point Shortly after I received my private pilot's license, the president of a large corporation asked what I thought of his idea of purchasing a cabin plane, employing a pilot, and thus visiting the various branches of his business I suggested he get a dual control machine so he could fly part of the time himself He laughed at the idea saying it would be enough for him to fly as a passenger without trying to be a pilot Several months later I asked him about his plane. He said, "I'm saving a lot of time with it and find I enjoy taking the controls when we have plenty of altitude, but that's as far as I'll ever go as a pilot" The next time I saw him he said, "I'm making landings and takeoffs, but I'll never fly without a pilot I have two children and many responsibilities, so why should I?" "Wait and see," I predicted I didn't see him again for about a year when he eagerly said, "You win I fly alone on all my trips now I have a pilot's license and take my wife and children with me on many of my flights" Since then he has totalled several hundred hours solo flying and is said to be a first-class conservative flyer However, it took him over a year from the time of his first flight, to start his solo flying

I do not believe that many of the present older generation will learn to fly, but many of the young men now in high-school and college want to take up flying for sport or as their profession I believe parents' resistance to this idea is being lessened as flying becomes more common and they become better acquainted with it This plus lowered cost of airplanes and increased accessibility of good airports to the residential sections of our cities and towns, is going to help the progress of aviation

Personally, I have had more enjoyment out of learning to fly than I have had out of any other experience I have been through It is true that my golf game has suffered but it was never very much to brag about, anyway, so the loss is not great

As one pilot to another, let's talk more and higher flying

SPORTSMAN PILOTS OR PROFESSIONALS

By C. S. (Casey) Jones
President, Curtiss-Wright Flying Service, Inc

The inauguration this year of contests for sportsman pilots brings up the question of who is an amateur racing pilot and who is a professional? In looking back at the years of air racing in this country, Casey Jones finds little with which to define the professional pilot. It is his opinion that this new idea is a matter of interesting a new class of contestant rather than a question of professionalism.

THE National Air Races, to be held at Curtiss-Reynolds Airport, Chicago, during the last week of August, will see an innovation in airplane racing namely, the contests for sportsmen pilots While no definite regulations have been set up defining just what a sportsman pilot's qualifications may have to be, it is assumed that this term refers to a pilot who owns his own machine and flies it simply for pleasure, as opposed to the pilot who, even though he may own his ship, uses it commercially

From the practical standpoint there has been but little purely professional racing in the history of aviation For a number of years the major contests were confined to Government pilots, both Army and Navy. Gradually a greater number of commercial contests were introduced, so that of recent years the number of commercial races have been in the majority Along with these races has sprung up a class of pilot who might be termed professional, and you may be pretty sure of finding Speed Holman, Eddie Ballough, Basil Rowe and others as contenders in the races I expect I have done my share over the past ten years

However, I don't believe that any of us consider racing in the professional light, but rather as a good sport, the prizes being incidental It seems to me that the most important proof of this spirit has been the co operation which racing pilots have always given each other in the event of their needing it I have known of a competitor in a race to lend a spare propeller to another competitor who had a good chance of beating him, and I have had pilots who were going to compete with me give me a willing hand in getting things into shape in order that I might compete against them In this respect airplane racing has been kept on a very high plane of sportsmanship, which certainly compares favorably with amateur competitions in any sport

CONSEQUENTLY I believe that the new competition was provided more with the hope of interesting a different class of contestants rather than because there is any question of professionalism These races will also give the amateur owner a fairer chance of winning than he would have if he had to compete with pilots who were in the commercial business, and who oftentimes receive valuable assistance in speeding up their engines through their connections with manufacturing organizations, which is not available without great expense to the sportsman owner

During the last month there has been considerable discussion as to the races held, and certain suggestions have been made that planes of a certain class particularly those of larger horsepower, were not getting an equal chance with some of the smaller jobs The point has also been raised that manufacturers were somewhat neglected in the matter of deciding upon what races should be held I am personally of the opinion that the Race Committee gave careful consideration to the contests but to avoid any possible feeling on the part of the manufacturer he should be asked his opinion before the contests for 1931 are decided upon Incidentally, the opening up of the races to the sportsman pilot as provided in the 1930 competitions, has obtained sufficient interest and entries so that it may mean that all the contests for similar horsepower in years to come will be run by sportsmen pilots for trophies instead of cash while the free-for-all in which the pilots and the companies backing them will be allowed free rein in the matter of speeding up their machines, would be run by professional pilots Such a policy might do a great deal to increase interest in racing, and will give everyone a fair chance to show his ability as a pilot and his ingenuity in obtaining the best performance from his machine.

THE LIFE HISTORY OF A WORLD'S RECORD

By Maj. Luke Christopher
Contest Secretary N.A.A.

and R. F. de Marolles
Commissaire Officiel de l'Aéro-Club de France

PART ONE: FROM THE FLYING FIELD TO WASHINGTON

READING in the newspapers that a new world's record has been established in aeronautics, few have any appreciation of the long road which must be traveled to make possible that simple announcement.

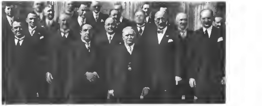
It all begins when the sponsor of the attempt at record breaking, individual or organization, writes a letter to the Contest Committee of the National Aeronautic Association giving in detail the proposed attempt. This notice should be, but frequently is not, given at least a month in advance in order that the Contest Committee may have proper time to arrange all details. Often it happens that we are obliged to make arrangements on much shorter notice. For the purpose of this article I shall assume that a plane manufacturer has ambitions to establish a new world's speed record over a 50 km. closed course.

Our first step upon receipt of the application is to determine the eligibility of the pilot or pilots. In this country pilots must hold both an FAI certificate and an N.A.A. Annual Sporting License. They must be American citizens to have the record stand to the credit of the United States. It is not necessary that the plane have an approved type certificate as the Federation Aeronautique Internationale does not recognize the Department of Commerce. The contestant must establish the 50 km. closed course unless one already exists. The distance between the two pylons must be surveyed and certified by an accredited engineer. The pylons must be set in concrete so that they cannot be shifted so much as an inch. The course is certified as being accurate and can be measured for a 50 km. course by chain measurement or triangulation—if greater than 50 km. over the arc of the great circle and the position of the location of the pylons must be shown on maps in triplicate to not a greater scale than one over 10,000. These courses are accurate to within the inch as the longitude and latitude are shown on them all.

The Contest Committee then appoints a Directing Official to supervise the attempt. If I find it impossible to be on hand myself, there is available at N.A.A. headquarters an eligible list of about 35 F.A.I. timers who may be appointed. These individuals are selected with the greatest care. First they must pass a thorough examination by the Contest Committee as to their ability to mathematically convert kilometers to miles, meters to feet and figure the speed in miles per hour or kilometers per hour by a set formula given in the F.A.I. Rules. They must also have good eye sight and not get excited too easily, and have a good reputation as to character, etc. After they have been approved by this Committee their names are sent to the headquarters of the Federation Aeronautique Internationale, where their examination and approval are certified to by the Secretary-General of the F.A.I. Possessed of this certificate our F.A.I. timers are qualified to supervise and time any record breaking attempt in the 33 countries represented by the F.A.I.

We have available at headquarters a number of approved stop watches, tested and certified to by the F.A.I. and rechecked at the United States Naval Observatory every two years to make sure they are functioning perfectly. It takes about six months to calibrate a watch in accordance with F.A.I. Standards and it is calibrated in six positions and must be accurate to a hundredth of a second in each position for a certain length of time. It is also given both cold and heat tests. As an illustration of how good a watch may be, the Aggasiz watch made in Switzerland is supposed to be one of the best built watches in the world. Six of these watches went into the laboratory in Switzerland for F.A.I. Standards test and only two passed.

Few members of the industry ever stop to consider that vast amount of detail work necessary before the performance of an aircraft receives official recognition as a world, or international, record. ¶In Part One of the accompanying article Major Christopher tells of the life of a record from the flying field to the N.A.A. at Washington. Part Two by M. de Marolles deals with the record after it reaches the offices of the F.A.I. in Paris, France.



A group of F.A.I. officials and delegates with M. Gaston Doumergue, president of the French Republic

Two official observers are appointed, each to be stationed at a pylon. No special requirements are necessary for these observers, merely that they shall be persons of sound ethical standards and preferably N.A.A. members.

THE Contest Committee has no concern for the number, type or reliability of the instruments installed in the plane which will make the attempt. We place our confidence entirely in two instruments of our own, the barograph and the stop-watch. We have available at headquarters, a number of barographs calibrated by the United States Bureau of Standards. Barographs must be carried on all record trials with the exception of speed over a course where the plane can be certified as to its compliance with the F.A.I. Rules by the official observers. It is necessary to deposit $50 for their use which is returned less a sanction fee which goes to the Bureau of Standards for calibrating. If the barograph is kept over a period of two weeks, an extra rental fee of $50 a day is charged after that period.

Because of a recent scandal where invisible ink was used on a pre-prepared barograph chart in the making of an alleged world's record, an ink graph may no longer be accepted as an official record. It is necessary to smoke the chart on its drum so that the pen will trace the record on the smoked chart.

In one attempt recently, an inexperienced supervisor disengaged the graph and smoked the metal drum of the barograph. Consequently, there was no record when the attempt was completed.

The closed course has been surveyed and certified to, the pylons have been erected in their concrete bases, and the directing official with his barograph and stop-watch has arrived at the starting point. Only one timer is necessary on any trial except maximum speed trials. On maximum speed trials in accordance with a ruling of the F.A.I. in June, 1929, the passage of the plane over the starting line for a 3 km. course must be either automatic or photographic. This necessitates a timer being stationed at each end of the 3 km. straight-a-way course. Two stop-watches in this instance are used and are photographed in the timing apparatus at the same time the camera shows the position of the plane over the starting or finish line. Timing wires have been erected at right angles to the race course, and the would-be world's record maker has taken to the air a mile or two away. The directing official has observed that before crossing the starting line, which is also the timing line, the plane has been flying in a horizontal position for at least five hundred meters. This is to prevent any abnormal acceleration of speed through a diving start. The Contest Committee's representative observes this rule visually. At each pylon the observers are watching to make sure that the marker is fully cleared as the pilot banks.

And now the machine speeds across the finish line after covering the course as many times as is necessary for the record he is attempting to break. As he flashes above the timing wires for the last lap, the stop-watch of the directing official clicks. Our representative watches the plane land. Within his sight it turns and taxies back to enable him to personally remove the barograph which he installed. Pilot and plane may then go their joyous way, but the directing official's work has just begun.

He must submit to the Contest Committee as soon as possible:

1—Photographs of the airplane which made the attempt, in triplicate.

2—Photographs of the pilot or pilots, in triplicate.

3—Certificates from each pylon observer that the markers were properly cleared, in triplicate.

4—Report of the timer who may also be the directing official, in triplicate.

5—A blue print of the race course properly certified to, by an accredited engineer, in triplicate.

6—Certificate of weight of the plane, empty, in triplicate.

7—Certificate of weight of the pilot or crew, in triplicate.

8—If the attempt involved the carrying of a load of any kind there must be pictures of the load carried, and a certification of the weight of load upon *landing*, in triplicate. It is vital that the load should be weighed upon landing on certified scales, certified to by the Public Weights & Measures Officials of that locality, to make sure that none was lost in the flight. An Army pilot once lost credit for a world's record with dead load after making

11 He was carrying the contest lead in the bomb rack of a military plane and after completing the course he dropped it as he was coming in land. The lead carried became for all time unofficial

Each and every one of these reports must be sworn to before a notary public. One set of the reports is retained for the office records of the Contest Committee of the N.A.A. One set is supplied to the pilot who attempted the making of a new world's record. The third set is used only if the Contest Committee finds that a record apparently has been broken. In that case the Contest Committee approves the report and the third set of data is forwarded to the Secretary-General of the Federation Aeronautique Internationale in Paris, with a letter signed by the Chairman of the Contest Committee requesting that the record be homologated in its proper category. However, no announcement of a world's record may be made in this country. Until the records have been examined, confirmed, and approved by the F.A.I. in Paris, the attempt is not official.

The recent popularity of attempts at refueling endurance records have shown the necessity for a new type barograph. The present barographs run down in eight days. Consequently, after the eighth day it is necessary that the endurance plane keep within the sight or hearing of observers representing the Contest Committee. In the recent case of the Hunter Brothers six observers were available to see that there was no violation of this rule. Like soldiers on guard-duty two observers were constantly watching the sky, or listening for the sound of the engine when it was too dark to see. The new barograph being constructed will have a special drum which will revolve but once in a hundred hours, and the key to wind it, when it is in danger of running down, will be on the outside where the contestants themselves can wind it.

When a barograph is received by the Bureau of Standards the seal is broken and the barograph is placed under a bell jar where a vacuum can be created to represent atmospheric conditions or simulate the rarified air conditions encountered in the flight. As the vacuum is created in the bell jar the action is recorded on a graduated tube of mercury and the official who is observing the calibration, when the barograph reaches the highest point that the needle has shown on the smoked chart, can automatically convert the number of inches of mercury caused by the vacuum created in the bell jar to the altitude in feet, F.A.I. Standards. For endurance records the barograph is wound and started at a set point on the barograph drum and the drum is allowed to revolve, timed by a calibrated Bureau of Standards chronometer. In this manner the calibrater is able to determine the hours, minutes and seconds of the flight.

Official barograph of Roland Rohlfs altitude flight Sept 18 1919

PART TWO:
FROM WASHINGTON TO PARIS

IN THE early days of aeronautics, during the Olympic Congress held in Brussels on June 10, 1905, three pioneers, the late Count de La Vaulx, Major Moedebeck and M. Fernand Jacobs, launched the idea of an International body destined to unite the efforts of the various National Associations devoted to the promotion of the new science. The scheme was favorably received and, on Oct. 12, 1905, the first F.A.I. meeting was held in Paris under patronage of the Aéro-Club de France. One of the cardinal objects of the new Federation was to codify records and competition and ensure international recognition of the best performances officially checked by representatives of each National Association affiliated to the F.A.I.

Aviation was still in its infancy then, and the question of controlling records was not precisely defined as it is now. As recalled by M. Paul Tissandier in the course of a recent speech, methods of distance measurement were rather crude at the time. When M. Santos-Dumont made his first experiments with his historical "XIVbis" tail-first biplane at Bagatelle field, in the Bois de Boulogne, near Paris, he was followed by a car where the timekeeper, M. Archdeacon, had taken place. The latter had imagined to throw ordinary meal plates on the ground to mark the spot where the machine had left the ground or regained it. But plates, of course, did break and souvenir hunters immediately picked the bits, so that the chances of accurately measuring afterwards the distance traveled in the air by Santos appeared rather remote! Mr. Archdeason soon improved matters by replacing plates by small sacks of flour, which were respected by fanatic onlookers. The first world's records in history were checked in this manner on Nov. 12, 1906, when Santos travelled 220 m. (721 ft.) in 21.2 sec., thus establishing distance, duration and speed marks officially recognized for the first time in history. Incidentally, the speed figure worked out at some 25 mi./hr., the height was not measured (it was in the region of five to ten feet) and the first World's altitude record registered by the F.A.I. appeared only some three years later, when that fine sportsman, Hubert Latham, reached 155 m. (508 ft.) at Reims, on Aug. 29, 1909.

For some years, approval of a performance as a World's record by F.A.I. was made on receipt of a certificate by the National Association of the country where it had been made. After the War, it became obvious that more details were required to insure that the claim was justified.

THE F.A.I. publish each year its "Sporting Code" containing details about all classes of performance and the methods of checking their accomplishment. Each National Association must follow the rules so defined

when there are grounds to believe that a performance already homologated by the Contest Committee of the Association is likely to constitute an International Record, a complete set of documents is forwarded to the F.A.I.

A thorough examination of the informations and figures submitted then follows. For instance, duplicates are not allowed. Original documents must be supplied, with signatures duly certified. A general survey is so made, and, if some information is absent, or incomplete, or imprecise, additional data are immediately requested from the National Association in cause. There is thus sometimes a lengthy exchange of correspondence which delays the approval of the records. On the other hand, some Associations are very long to forward the documents to the F.A.I. after the performance is achieved. This explains why approval by F.A.I. is frequently issued some months only after the record flight has been made.

When the set of documents is complete, each information is duly checked. For instance, in the case of records in closed circuit, a map of the course must be included, with accurate calculation of its actual length certified by some authority. Timekeepers must be officially recognized ones, and so on.

At the point where it is apparent that everything is correct with the figures supplied, all the calculations are checked. This is especially important in the case of distance records made by using several circuits, as practiced recently by Costes and Codos. In the case of altitude records, the barograph is calibrated by some competent authority of the country where the attempt was made, and the resultant minimum pressure attained has to be translated into height. This is made by use of the table calculated by M. Soreau and officially adopted by F.A.I. for altitude record measures. This table is not the same as the Standard Atmosphere Table used generally and is calculated according to the formula

$$H = 5\ (2\,064 + 1.78\ p - 0.0011\ p)\ \log \frac{760}{p}$$

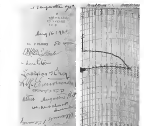
where p is the pressure in mm. of mercury and H the height in meters. The altitude retained for approval of the record is determined by taking minimum value of p as yielded by calibration, expressed to the nearest half-millimeter. For instance,

140.0 mm. is taken for 140.0 mm. = 12 088 M. (39,588.5 ft.)
140.4 mm. is taken for 140.5 mm. = 12 043 M. (39 511 ft.)
140.6 mm. is taken for 140.5 mm. = 12 043 M. (39 511 ft.)
140.7 mm. is taken for 140.5 mm. = 12 043 M. (39 511 ft.)
140.8 mm. is taken for 141.0 mm. = 12 020 M. (39 436.6 ft.)

This procedure is justified, since F.A.I. rules require a difference of at least 200 m. (656.2 ft.) for a new altitude mark to be eligible as a new record.

When the calculations have been checked, the precedent figure is compared to ascertain whether it is exceeded by the required margin or not. For example, duration records must exceed precedent mark by at least 5 min. below 12 hr., 15 min. between 12 and 24 hr., 30 min. between 24 and 48 hr. and one hour above 48 hr. Similarly, airline distance records are required to be at least 100 km. (62.2 mi.) superior, except for light planes, where 50 km. (31.1 mi.) are considered sufficient. For speed records, a margin of 8 km./hr. (4.95 mi./hr.) is required.

If the above condition is complied with, the approval of the new record is pronounced, it is entered on the F.A.I. official list and a letter is sent to the National Association concerned to notify the decision.



Barograph and witness record of an altitude flight of a Loening Flying Yacht, Aug. 16, 1921

Each year, the annual Conference of the F.A.I. examines the records made during the twelve precedent months and the list is included in the proceedings of the session.

THE F.A.I. now comprises 30 affiliated countries and a considerable number of records have been officially approved. A short statistical review of these is interesting.

Since its foundation, the F.A.I. has approved 72 records for Class A (free balloons), 19 for Class B (airships), 898 for Class C (land planes), 210 for Class C bis (seaplanes), 20 for Class D (motorless planes), 5 for Class G (helicopters), and in addition 10 for kites and scientific instrument-carrying research balloons, making a grand total of 1,234 records.

As for nationality the above list discloses the following figures. France, 539 records, U.S.A., 250, Germany, 141, Italy, 87, Austria 56, Great Britain, 41, Switzerland, 19, Denmark 16, Belgium, 15; Holland, 15, Argentine, 14, Russia 13, Czechoslovakia, 13, Sweden, 10, Hungary, 4, Poland, 1.

Until recently, all records recognized by F.A.I. were uniformly termed "World's Records." As the list was ever growing, the value of the term became lower and lower, and it was very wisely decided to reserve the appellation of "World's Record" to the best performance in a given direction, irrespective of class, all other recognized performances being retained under the title of "International Records." There are thus only five "World's Records" now: duration, distance in closed circuit, airline distance, altitude and speed on 3 km. course. Refueling records rank as "International Records" in a special class.

Development of aviation all over the world has led to an ever-increasing battle between nations to obtain supremacy in the record field. Thanks to the activities of the F.A.I. their efforts remain written in the international roll of honor which constitutes the technical history of the endeavors of man to conquer the skies.

FLYING

FOR THE PRIVATE OWNER IN GREAT BRITAIN

By
Colonel The Master of Sempill

President of the Royal Aeronautical Society

WHEN any discussion takes place here in regard to some aspect of private flying (and such a discussion always arises when one or two of the aeronautical community get together) reference is made to the United States and to the fact that the opportunities for flying i.e., the exploitation of distance and the love of flying are not so marked here as without doubt, they are in America

In this country flying by private persons for purposes of business, sport and pleasure is slowly on the increase The "slowly" should be emphasized because development is bound to be slow as the provision of an adequate ground organization takes time In my own view it is the serious lack of ground organization in this country that is the primary hindrance to the more complete and rapid development of flying The secondary but by no means unimportant, factor is that of cost At the present time there are very few civil airports in Great Britain, and these few are not yet all completely equipped and organized The situation might be somewhat paralleled by imagining a railway line without stations or mechanical signalling

There is a strong movement on foot now to persuade municipalities to organize landing facilities, and that generous benefactor to aviation Lord Wakefield of Hythe, made it possible for Sir Alan Cobham to do a series of propaganda tours to stir up the interests of the various townships. There is, undoubtedly, a lot of interest but the provision of airports or landing grounds as a essential asset to any town worthy of its name, is still some years from realization A municipal body with adequate funds and vision is a very rare organization indeed Anyone owning an airplane today is much restricted in what she or he can do, since although there are a large number of airports in the country the majority of these belong to the Royal Air Force and are only available for the private machine in an emergency

The Government has looked ahead in these matters and, quite recently, subsidized an undertaking called National Flying Services, Ltd., for a period of ten years on the understanding that twenty airports and 80 landing grounds will be provided, the maximum subsidy amounting to $487 000 in that time The subsidy is based on results achieved, i e., no results, no subsidy. This organization has set out to develop private flying in every practicable way, and to undertake the training of pilots at very advantageous rates, such rates being rendered possible by the subsidy It aims to build up a number of airports adjacent to the important cities, to be linked together by a network of landing grounds throughout the country

THE Government, too is continuing a policy that has been in force for some years by subsidizing the various local flying clubs, of which there are about 30 in existence These clubs have produced really splendid results, being run by very keen pilots and enthusiasts who have put in an immense amount of voluntary work for the good of the cause. The clubs provide flying and social facilities and have produced many splendid pilots of both sexes, the most notable at the moment being Miss Amy Johnson, who flew to Australia, and Miss Winifred Brown, who won the King's Cup Race round England on July 5

The subsidy paid to the light aeroplane clubs has been one of the best investments made by the Government in connection with aviation, as the amount of money involved has been small (about $125 000 per year), but the effect has been appreciable Pilots and engineers have been trained and a knowledge of flying has been disseminated amongst the general public In addition the still very small but gradually growing industry for the construction of civil and commercial machines has been helped with orders, even if only in ones and twos

In addition to being president of the Royal Aeronautical Society, Colonel The Master of Sempill is himself owner of a light plane and one of the most enthusiastic private pilots in Great Britain. He has long been associated with the development of civil aviation in that country, and is therefore more than ordinarily qualified to write on the subject he has chosen. His enthusiasm, incidentally, was attested by his recent personal participation in the King's Cup Race around England.

In addition to the subsidized organizations there are a few unsubsidized firms giving flying instruction, doing taxi work and joy riding, acting as general agents, and so on, and, in fact, endeavoring, by unremitting hard work and good organization, not only to make both ends meet, but to derive a profit This certainly requires a great deal of sustained enthusiasm, as these organizations have a very difficult time The clubs, on the other hand, only aim to make both ends meet, and although they have a certain paid staff a lot of work is done voluntarily The best organized of the above-mentioned firms, which have adequate financial backing, will undoubtedly find their feet, but their position is not easy in view of the fact that there must naturally be a certain amount of competition with the subsidized organizations

Flying tuition at a club up to and including the taking of an "A" license, which is the type of license required of all private individuals, may cost, including a year's subscription and entrance fee to that club, some $200 or thereabouts If similar tuition is obtained from a purely commercial concern the cost may run as high as $350 Having gone through this stage, the newly-fledged pilot may hire machines at the clubs at a cost that may be as low as $7 30 per hour, or $19 50 per hour if hired from a commercial concern

Many people never get any further than this, due to the lack of ground organization, as mentioned, and because of questions of cost and maintenance; but all these disadvantages are gradually being removed

THERE are many different planes on the market suitable for private owners, ranging from the single-seater Comper Swift at $1 950 to the three-place enclosed DeHavilland Puss Moth which sells for $4,870, and then into the class of more luxurious multi engined machines The popular Gipsy Moth costs $2,900 for the standard model, while the Bluebird, Avian, and Spartan are a little more expensive but of similar type

Running costs depend on many things the amount of flying done per year, the experience of the pilot, and so on, that it is impossible to lay down any hard and fast rules Insurance may prove a big item and this varies

Above the Comper Swift powered with a 80 hp. engine. Left the DeHavilland "Puss Moth" fitted with a Gipsy Mark III engine (Courtesy of *Flight*)

with the known skill of the pilot; but the tendency will be for costs of this nature to go down, particularly now that the Gipsy engine is guaranteed by the makers against mechanical failure.

The following figures will give an approximate idea of the cost of running a private light aeroplane in Great Britain

Garage per annum	$242
Insurance per annum	*243
Yearly certificate of airworthiness	†$24
Oddments such as maps etc	$73
Cost of fuel, oil allowance for maintenance and overhaul of engine landing fees etc. approximately, per hour	3 90

*Or more depending on the skill of the pilot

†Plus an average of about $146 for re-painting, re-doping and general minor repairs to the machine.

On the basis of 200 hr per year

Standing charges	$730
Running charges	779

Assuming an average of 80 m p h , the cost would work out at about $0 09 per mile

These figures will vary with different machines and different pilots, but they give a fair indication of costs for running a machine like the Gipsy Moth, which is well known in America Larger machines are also coming into use as the flying habit spreads and wealthy men begin to see the advantages they can reap in their business in traveling by air

It is impossible to go into the many aspects of this very wide subject and to give a lot of figures as to cost, performance, and so on as nothing is more tiring than having to wade through masses of figures which, in any case, can be better studied in the specifications of the various manufacturers Perhaps, however, it may be interesting to give a few figures to show the general increase in civil and commercial flying during the past ten years.

	A License Pilots	B License Pilots
1920	175*	—
1925	309	74
1930 (to date)	1 225	255

*New system not in vogue—all war-trained pilots.

A License is the license that everyone who pilots a machine must hold, but this does not allow the pilot to carry passengers or goods for hire or reward

B License is the license required by all air line pilots before they can be employed for commercial work A pilot has to be very fully qualified and to pass examinations on a variety of subjects before receiving a "B" license

Private airplanes

1920	A few
1925	16
1930 (June 30th)	200

Airplanes belonging to flying clubs

1920	No clubs
1925	16
1930 (June 30th)	62

Airplanes used for taxi work, joy riding sky-writing, and miscellaneous

1920	166*
1925	42
1930	160

*Converted war machines

The future outlook for private flying is good Facilities are being gradually opened up and it is likely that in a few years' time a machine such as, say, the Gipsy Moth should be purchasable for about $1,220 The more advanced and adventurous pilots are going out quite regularly, and not only in the summer, on tours all over the country or to the various odd corners of Europe and even farther afield to Egypt and India It is not uncommon for private owners to use their machines to fly over to Switzerland for the winter sports, or to the South of France or North Africa to get a glimpse of the sun which is generally denied to the inhabitants of these islands for many months in the year

All this is generally to the good and is tending to increase the man-in-the-street's knowledge of and respect for aviation But, unfortunately, there are little set-backs, as the good work done by the majority is sometimes discounted by rash and too adventurous stunting by the minority, very often ending in a fatality Such occurrences, however, are rare, which is fortunate as it is essential that the general public should come to regard aviation as a logical and ordinary way of covering the ground quickly, and not as a kind of hair raising adventure

In the hard school of practical experience which, insofar as British light airplanes are concerned, has been world wide the machines and engines are being developed It is only by continuous flying under a wide variety of conditions that all the faults that must exist in any new design can be found and properly eliminated

The majority of the older established British firms interested in aviation, with the sole exception of one well-known company, have as yet very little, if any, contact with civil aviation New firms producing civil machines are coming into being, but there are not many of them and they are rather small at present

THE light airplane movement is really the mainstay of British air enterprise, and many of the future routes to other parts of the British Empire have been pioneered with this type of craft. It has often been said that the British Isles are so small and are provided with such an excellent railway system and good roads that there is little room for aviation, but this does not prove to be entirely true as cross-country journeys are difficult by rail and every day get more difficult and dangerous by road as more automobiles are produced and the traffic problem becomes more serious There is certainly room for internal air-taxi services as well as services from various parts of the country to important centers abroad Along these routes the private machine will certainly find its way

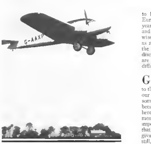
The bad climate of these islands, which produces poor visibility all too often, has proved, in a sense, to be an advantage as it has tended to the production of good machines machines with good visibility and with low landing speeds and capable of very adequate control at low speeds, and, moreover, a high standard of general flying It is often necessary to land in all sorts of out-of-the way places due to bad weather conditions; but, of course, as the ground organization becomes more complete the chances of these involuntary hold-ups will become less

The closed machine is, without any question, the machine of the future, and there is no sign whatever of the air-cooled engine being in any sense displaced, so far, at least as the light airplane is concerned

It is to be hoped that there will be a greater interest taken in the development and use of small seaplanes and flying boats Personally, I infinitely prefer the latter to any airplane and, in these islands, they are often far more useful, as one can visit many places, say, on the West Coast of Scotland, and in Ireland, that are quite impracticable for the airplane. The small seaplane has, too, a number of advantages, particularly when one visits out-of-the-way places, in that it does not get eaten up by cows or damaged by the too-pressing attentions of the young and would-be air-minded in the district In many ways it is not necessary to create a large and expensive organization to provide facilities for seaplanes as such already exist, at least, in the majority of harbors and lakes where small yachts are catered for Those interested in this aspect of flying have followed with a great deal of interest the developments of sea-going aircraft and amphibious aircraft that seem to have been so intensively pursued in America

One hopes that touring by air in various countries will be developed and encouraged in every way by the competent bodies For example, it is very rare indeed to hear of an American coming over here to do Europe bringing his airplane with him Perhaps next year there will be some examples of such touring by air, and perhaps we, from our side, will be able to do likewise in the United States This will be all to the good as it will bring together all those who are interested in the great cause—the progress of aeronautics,—and by discussing the many problems involved, many of which are yet unsolved, and appreciating and measuring our differences, real and lasting progress will be obtained

Right: the Saunders-Roe "Cutty Sark" fitted with either Hermes or Gipsy engine Below: the Segrave "Meteor" (built by Saunders-Roe) powered with 2 inverted Gipsy Mark III engines.



GLIDING in its rejuvenated form and soaring, are now commencing to make some headway over here thanks to the assistance received from and given ungrudgingly by our German friends It has been interesting to note that something of the same kind, aided in the same way has been going on in the United States There are many here who are rather sceptical as to the value of this movement but I think it would be difficult to exaggerate its importance, always provided it is adequately handled and that proper schools are organized and maintained for giving instruction After all, flying for the majority is still, for financial reasons, a closed book, but the gliding and soaring movement is one in which all can participate It brings aviation right into the purview of the man who can afford a bicycle It is of scientific and technical value but, of course, it is acknowledged that the movement will primarily rest on the sporting interest that will be engendered by the holding of soaring flight competitions

We in this country are supposed to be very fond of the sea and to like sailing and so on, but there are not the facilities to enjoy this sport except on rare occasions The country, however, is well adapted for soaring flight and the immense amount of interest that has been shown at recent demonstrations has led to the formation of at least 50 gliding and soaring clubs. This leads me to believe that this new movement has a very wide future

But the success of private flying, whether with motors or without, and, in fact, the successful development of the wide civil and commercial aspects of aviation in general can only be achieved by all those interested working closely together and making the experience they gain common knowledge.

THE STORY OF WICHITA

By John T. Nevill

Detroit Editor of AVIATION

This article is the first of a series of three dealing with the interesting aeronautical history of this mid-western city which has produced approximately one-fourth of the commercial airplanes manufactured within the United States. The second article will appear in an early issue of AVIATION

EVERY now and then one is asked to explain how it came about that Wichita, Kan., (pop 114,000), has produced approximately one-fourth the commercial airplanes manufactured within the United States

With one eye, figuratively speaking on the fact that the building of airplanes, like the production of automobiles, furniture, shoes or clothes, machine equipment etc., is a manufacturing process rather than a direct reaping of natural resources and with another eye on the fact that except for airplanes, Wichita is not generally known as a manufacturing center, the inquisitor usually wants to know something about the "industrial evolution" leading to the effect involved.

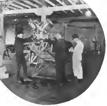
How is it, the inquisitor asks, that this comparatively small mid-plains city ranks alongside of New York, Detroit, or Los Angeles in the manufacture of the world's newest vehicle of transportation? How is it the mighty millions of Chicago, Philadelphia, Boston St Louis and Kansas City have been surpassed by the 114,000 of Wichita? Why is that Wichita has had 16 or more airplane factories, at least four of which have been leaders in commercial aviation? Why does this Kansas town have more than 1,640 acres devoted to flying fields, one of the 11 fields being a 640 acre tract operated by the City of Wichita as one of the finest airports in this country? How comes it that Wichita has been able to boast of six airplane engine factories, even though still in the experimental stage? What created the city's 13 schools teaching flying, or some allied trade? How do you account for nine air transport concerns, 25 or more firms either manufacturing or handling aeronautical accessories or supplies, seven firms devoted to airplane or airplane engine service, five aeronautical investment houses, the $5,000,000 or more it has invested in airplane plants, or the fact that there have been as many as 2,000 men and women employed in its own aircraft work?

For each of these queries—and a dozen or more others—the native Kansan can give you a logical answer One answer is topography A second is geography A third is climate A fourth is air-mindedness mentally, physically, and financially. A fifth, general "go-getterism"

The aircraft industry has been witnessing since the beginning of the "boom," a keen struggle for domination in this comparatively new and exceedingly promising commerce Having a teeming, vibrant, dynamic Detroit and the automobile industry as a precedent half a dozen cities, or more, are out to become "air centers" or "air capitals" or whatever one may term the nucleal concentration of this potential industrial giant. Both Wichita and Los Angeles tell you that airplanes are best made where the smiling sky is ever waiting to serve as proving grounds for the unit product Wichita goes further, saying that her flat lands and her geographical location "within a day's flight of any point in the United States" are assets the industry cannot overlook New York reminds the industry that she is the "front gateway" to America, as well as being the "money capital" of the nation Detroit, with her knowledge of mass production, shouts from the housetops that extensive flat lands and continually smiling skies are not necessary, that airplanes will be crated and shipped to the future markets, not flown Chicago, as yet, has not made much of a bid for aircraft manufacturing honors, but she is parrying with Kansas City, and even with Wichita, for supremacy in the transportation end of the business Other cities quietly but steadily building airplanes and watching their chance to get into this fight with both feet include, Buffalo, Cleveland, St Louis, Baltimore, Philadelphia, Little Rock, Tulsa, and Seattle

IT is not the purpose of this and succeeding articles however, to analyze the development of aviation in Wichita, except insofar as the ancestry of its present airplane plants are concerned It should be explained, also, that when we speak of Wichita's airplane plants we mean Travel Air, Stearman, Swallow, and Cessna There are others and they shall be mentioned

Out in Wichita they are pushing aviation as the city's "best bet" toward a perfectly natural ambition to be-



Left George Weaver assembling an Anzani powered Laird plane at St Paul in 1910 Below, Installing the engine in the first Laird Swallow in Wichita 1919.

come a prominent and fixed star in the nation's industrial firmament Since its founding in 1870 by the hardy cattlemen of old Chisholm Trail, Wichita has successively played "second fiddle" to other cities in the various industries it has espoused The combination of cattle and grain gave it birth, the latter having remained to make it the fourth milling center in America today Oil and railroads each have contributed generously to the city's growth and stability, as has even the raising of the lowly broom-corn Today Wichita's assessed valuation exceeds $135,000,000

Wichita, the one time buffalo hide trading post, during its sixty years of existence, has welcomed these industries, and others of lesser importance, to its bosom She has nurtured them and they have nurtured her, but always her hopes have been realized so far and no farther And now, in her youngest child—the airplane—Wichita sees her own ascendency over industrial air transport

They tell you in Wichita that the city's aviation history began "aeons and aeons ago when prehistoric seas subsided, leaving a vast mid-continental plain that was destined to become the largest natural airport in America" Now, be that as it may, "aeons and aeons ago" is really a long time back, so, since we are chiefly concerned with the present generation as represented by men like E M Laird, Walter Beech, Clyde Cessna, Lloyd Stearman, J M Moellendeck, Mac Short, Walter Innes, Jr., and others too numerous to name, we will begin with—say the year 1910.

In 1910 seven years had elapsed since the world's first successful flight of a man-carrying, power-driven heavier-than-air craft Aerial feats by such men as Wilbur and Orville Wright, Glenn H Curtiss, Louis Bleriot, Henri Farman, Santos Dumont, Claude Grahame White, George Chavez, J B Moissant, and a number of others in America, in England and in France had opened the eyes of the world to the wonders, if not the commercial potentialities of flight Wichita, of course, had heard of these pioneers, but was not greatly interested The city's only actual contact with aeronautics, insofar as the records show, had been the visit to Wichita in October, 1908, of Roy Knabenshue and his 40 hp dirigible But certain young men, then residing in other sections of the United States, and destined to form the nucleus of post-war development in the Kansas town, were actively interested, and giving much of their spare time to this absorbing study Thus we introduce "Matty" Laird

E. M (MATTY) LAIRD was an office boy in the First National Bank, of Chicago, in 1910, when he saw Walter Brookins make an airplane flight for the old Chicago *Record Herald*, now the Chicago *Herald-Examiner*, During all his fourteen years young Laird had received no thrill like that Scarcely had Brookins' precarious appearing model B Wright pusher left the ground on Chicago's old water front before Matty decided that the banking profession somehow must learn to struggle along without him He did not quit the banking business immediately, but he might as well have. Everpresent thoughts of propellers, wing sections, control surfaces and horsepower left little room for absorption of knowledge about interest, sight drafts, clearing houses, or collateral—if you get what we mean

Young Matty had a friend of about his own age named George Weaver, who somewhere, somehow, had annexed the nick-name of "Buck." During the days and months that followed Brookins' exhibition of dare-deviltry, these two youngsters went through all the experiences common to very young students of aeronautics They built model planes—both the scale and the rubber-band types—and became charter members in the Illinois Model Aero Club, keeping in mind, meanwhile, a deep seated ambition to build a real machine they could pilot themselves

Despite his utter inexperience—he had never so much as flown as a passenger—this young aeronautical novice, Laird, dared to have some very definite ideas of his own relative to the building of airplanes For one thing, the trend in the ratio of horsepower to useful load since the Kitty Hawk flight did not suit him, He believed the

ratio could be materially reduced without loss of efficiency, and he set out to prove his point.

Early in the Fall of 1912, at the age of 16, Matty Laird completed his first airplane, a diminutive one-place contraption, which he called the "Baby Biplane." For sake of old times and because the "Baby Biplane" is really an ancestor of a distinguished line of airplanes dominating the American market today, let us glance back at this relic. First it was powered by a four-cylinder, vertical in-line, air-cooled Hofer engine assembled with some additions and modifications, from automobile and motorcycle parts. This engine had a bore of 3½ in. and a stroke of 3¾ in., and developed 12 hp. at 1,150 r.p.m. It sits today on a block in Mr. Laird's private office below which dozens of workmen are kept busy building the trim and worthy LCB, a modern craft that can be called the "Baby Biplane's" great-great-great grandson. But that puts us a good deal ahead of our story.

Left to right: F. M. Shane, Frank Billings, Matty Laird and Billy Burke. Photo taken at the old Swallow Field, Wichita, 1920

Like other lifting surfaces of its time, the "Baby Biplane's" wings were thin but of deep camber and had the front spar at the leading edge of the span. The tips of both upper and lower wings were squared off, and the fuselage was somewhat square in section but tapered in plan form to the tail surfaces, where a huge stabilizer was spread out like an awning over a quarter-deck. The landing wheels, with an horizontal axle, were set well forward, giving the little ship in the air some resemblance to an animal "on the jump."

Just as practically all airmen of that day had to do, Matty Laird had to teach himself to fly. Having completed his plane he set out to do so. He was fairly familiar with elementary principles of airplane control, but, as stated, his actual experience in flight was at absolute zero. So he wheeled his pride and joy to one end of the old Cicero field, revved his home-made engine, and, without further "feel" of the ship, started for the take off. When his judgment told him he had sufficient speed he yanked the little craft into the air. Up it went to about 10 ft. or more. Then, according to the pilot's own admission, he became alarmed and decided he wanted down. So, shoving the controls forward, he obtained the desired effect. But the plane's contact with the ground was not all that might be desired. It was badly damaged, although Laird escaped unhurt.

Matty Laird re-built the "Baby Biplane" and eventually taught himself to fly, this time taking the precaution to accumulate considerable "time" just taxiing his midget marvel over the ground. By the close of 1913 and throughout 1914 the young pilot and his radically low-powered plane became well known about the various Chicago flying fields. Then he looked for other fields to conquer.

Throughout this period the aviator's chief means of revenue seemed to be the air meets and individual exhibition flying tours being made in various sections of the country by a dozen or more members of the then "death defying" profession. Eugene Ely, Jimmy Ward, C. C. Whitmer, Bob Fowler, Lincoln Beachey, and many others of that school were "cashing in" on public interest, so Laird decided to do likewise. In the Spring of 1915 he crated his "Baby Biplane," took Buck Weaver on as mechanic, and began an exhibition tour of five states, Kansas, incidently, being one of them. He returned from this tour triumphant, but convinced that if he was to compete with the increasing stunting proclivities of his contemporaries, he needed a heavier, higher-powered ship.

But work on such a ship was delayed while he designed and built his second airplane, another biplane, propelled by a twin cylinder Excelsior motorcycle engine generating at best 15 hp. Insofar as the records show, this one and only species of its breed bore no particular name. However, its importance lies in the fact that it was the first craft built and sold by Laird as a commercial airplane. It was built to order for a couple of men in Chicago doing business as "The National Airplane Company," and delivered to them in the Fall of 1915.

Matty Laird's third product was his vehicle to fame as an exhibition flier. No doubt you have heard of "The Boneshaker." The original "Boneshaker" was designed and built by Laird, and first flown by him in May, 1916. Despite its uncomplimentary nick-name it was an improved and worthy son of its two Laird predecessors. It boasted of a shiny new six cylinder, 45 hp., radial, air-cooled, Anzani engine, a 3 in 1 wheel control system and it had two cockpits instead of one. Its workmanship was decidedly superior to that of its ancestry and it could thrill spectators by capering about in the air as well as the occasion demanded. It is recalled that Matty looped the "Boneshaker" in June, 1916, becoming the sixth American pilot to perform that maneuver. Lincoln Beachey, Art Smith and Katherine Stinson were among those who had previously dared and successfully completed the loop the loop.

Miss Stinson, incidently, had learned to fly in 1912, in Chicago and by 1916 had become known all over the world as one of this country's earliest women fliers. She thought so well of the "Boneshaker" that she sought and obtained permission to use it on her barnstorming tour in the Orient, which took place during the winter of 1916, just following a sensational exhibition tour of the Northwest made in the same ship by Laird and Weaver.

In the interim—between 1913 and 1915—Buck Weaver had been doing some pioneering of another sort. He had gone East, where he worked for a time for the old Sloan Aircraft Company at Plainfield, N. J. While there he joined the Model Aero Club of New York, later known as the Aero Science Club, and became acquainted with such enthusiasts as E. P. Lott, Vincent Burnelli, George McLaughlin, Walter Phipps, George Page, R. S. Barnaby and Charles W. Meyers. From Sloan, Weaver went for a short time with the LWF (Lawson, Willard and Fowler) Company, at College Point, L. I., and still later affixed himself to the field division of Aeromarine Plane and Motor Company at Nutley and Keyport, N. J., where he was associated with Lott and Meyers. Following his sojourn in the East, Weaver returned to Chicago to travel a bit with Laird on the latter's first barnstorming tours as previously related. Then the World War, which had been in progress in Europe for two years, actuated another temporary separation of these two pioneers.

By the close of 1916 the government had established an Army Reserve flying school on old Ashburn Field—site of Laird's Chicago experiments—and, with four Curtiss JN's of early issue, was making some attempt to strengthen its air force. The reserve school at Ashburn was operated under direction of Captain Joseph Morrow and included among its students such names as R. W. (Shorty) Schroeder, now vice-president of Curtiss-Wright Flying Service, of Illinois, and the late J. D. Hill.

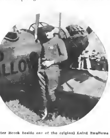
Buck Weaver obtained an appointment for training as a student flying instructor and went to Wright Field, Dayton, where the fine points of his vocation were taught him by our old friend, E. W. (Pop) Cleveland, now manager of the aeronautical division, Cleveland Pneumatic Tool Company. Shortly after that memorable April 6, 1917—will it ever be forgotten?—Weaver found himself at Rich Field, Waco, Texas, teaching doves to become falcons. It is significant to note here that there were at Rich Field at about that time at least two other men who later were to assume leading rôles in commercial aircraft development in Wichita. One was the late William A. (Billy) Burke, destined, with Matty Laird, to form Wichita's first commercial airplane factory, and the other was Walter H. Beech, later to become test pilot at that same factory, still later to form and head Travel Air, and later still to be named president of the Curtiss-Wright Sales Corporation. (Burke, a native of Okmulgee, Okla., and Laird had previously become acquainted at Ashburn Field, where Burke had been flying in an open faced, barrel-shaped biplane purchased from A. K. Longren, who built it at Topeka, Kans. While at Ashburn Burke had taken a fancy to Laird's Anzani powered "Boneshaker" and had expressed a desire to buy it but America's declaration of war interfered.)

Now let's get back to Laird. As related, Matty returned from his highly successful barnstorming tour of November, 1916, to find Captain Morrow's reserve school impetuously occupying the spotlight at Ashburn. Although finding time to work out preliminary designs for another airplane he had in mind, Laird devoted considerable of his time to the reserve school. His experience and ability was of such benefit that when the school was moved early in 1917 to Memphis, Tenn., Laird was offered shop space on the Memphis field if he would consent to lend his help to the school. The offer was accepted.

However, "Laddy" Laird, as Bill Pickens had dubbed him, did not remain long in Memphis. The shop space he sought there in order to fabricate the next season's exhibition ship failed to fully materialize, so March, 1917, found him in San Antonio, Tex., where the Stinsons were operating a flying school. It seemed that Katherine Stinson was interested in a single place Gnome powered tractor exhibition biplane designed by Walter Brock and Laird offered to test it for her. The ship spun in and Matty went to a hospital with injuries that crippled him for life. Thus he was in the hospital when the United States declared war against Germany.

During the summer of 1917 Laird was discharged from the hospital and returned to Chicago but by that time the government had placed a ban on all civil flying. In November, 1917, a recurrence of his San Antonio injuries again sent him to a hospital, where he remained until March, 1918. Immediately following his second discharge from the hospital he applied for appointment in the civil service at Dayton, meanwhile building his fourth ship. Before the appointment had gone through, the Armistice had been signed.

Laird's fourth conception was a two place sport biplane. The E. M. Laird Company (Matty was operating under a firm name by this time) rolled it off the "line" in June, 1919, and called is the Laird Model S. The Model S presaged its descendants in more ways



Walter Beech beside one of the original Laird Swallows

than one. Its well faired fuselage, its excellently cowled 50 hp. Gnome rotary engine, and its comparative scarcity of inter-plane wires gave it the clean, efficient appearance that is common in most airplanes today. Except for its air-cooled rotary engine and its reduced size it somewhat resembled the creation that was to be its immediate successor—the famous Laird Swallow.

The Model S stood one inch higher than the Laird Swallow although it was smaller in all other respects. It had a span (in both wings) of 27 ft. 6 in., a chord (in both wings) of 4 ft. 2 in., a length of 19 ft. 6 in., an empty weight of 650 lb., a gross weight of 1,075 lbs., and a useful load of 425 lbs. including 60 lbs. of gas and oil. It could attain a high speed of 70 m.p.h. and climb 4,000 ft. in 10 minutes. The very first model of this type was sold by Laird to Billy Burke, who, it will be recalled, had evinced considerable interest in the "Bone-

shaker" Burke, following the War had organized the National Exhibition Flyers "all kinds of exhibition flying" at Okmulgee Okla and used the ship to an advantage in his business

WHILE the E M Laird Company was building the few Model S Gnomes destined to be built and Billy Burke was barnstorming in the West Buck Weaver was in the East operating a what-can-we-do-for aerial service Having secured his release from his duty as civilian-instructor at Rich Field Weaver, in May 1919, he "joined up" with Charlie Meyers, who by that time, had become his brother in-law The two formed a company for the purpose of carrying passengers, conducting a flying school, transporting newspaper reporters and photographers to big news events, doing exhibition work, or taking on any other job within the capabilities of two "Canuck" training planes (Meyers during the War, had served in the Royal Flying Corps) The two planes were purchased in Toronto and the brothers-in-law inaugurated their service at once, picking up various jobs in Buffalo, Cleveland, and Toledo, before settling for the winter in Lorain, O This partnership was dissolved early in 1920, Meyers leaving on a barnstorming tour, and Weaver, with two other partners, Clayton J Bruckner and E. J. Junkin, organizing the Weaver Aircraft Company, of Lorain, O.

Meanwhile, other activities, destined to shape the careers of Laird, Burke, and Weaver, as well as many other individuals now master cogs in that city's aircraft machinery, were taking place in Wichita. Since Roy Knabenshue's visit in 1908 the city's interest in aircraft had been steadily increasing Periodic aircraft meets and occasional visits by individual members of the barnstorming tribe gave added impetus to this enthusiasm In May, 1911, Wichitans were thrilled to their backbones by a three-day air meet staged by the Curtiss Exhibition Company, and featuring such interpid performers as Gene Ely, Jimmy Ward, C C Whitmer and R C St Henry In November of the same year, Hugh Robinson, another "thriller" of those days, was brought to Wichita for a special exhibition held under auspices of the Wichita Wheat Show management The exhibition ended abruptly when Robinson's Curtiss biplane was wrecked and the "aeronaut" went to a hospital with a broken collar bone and two cracked ribs, but the accident left no permanent bad taste in the mouths of the city's enthusiasts In 1913 the Wheat Show again came to the front and presented the National Balloon Races In 1915 William H Lassen promoted an automobile and motorcycle meet, including, by way of change, some real dare-deviltry by an airplane pilot The airplane, according to the records, "stole" the show This year, it will be recalled, was the year Matty Laird and Buck Weaver visited Kansas with Laird's "Baby Biplane"

THROUGHOUT this period Clyde V Cessna, a native of Iowa, but at that time a resident of Kansas, had been gaining considerable "local fame" as an airman To Mr Cessna, in fact, goes the distinction of constructing the first airplane ever built in Wichita, a small monoplane equipped with a 6 cyl air-cooled engine This plane was built by Cessna in 1917 at the old Jones Motor Car Company plant, north of town, later taken over by the Bridgeport Machine Company, and now occupied by the Stearman Aircraft Company Always an adherent of the monoplane principle, Cessna had been interested in aeronautics since 1910 at which time he was living on a farm, near Rago, Kans A little later, while employed as a garage mechanic in Enid, Okla he purchased the fuselage of an American-made Bleriot monoplane from the Queens Airplane Company, Bronx Park, New York, and had it shipped to Enid, where he covered it, and constructed the wings For power he converted a 4 cyl, water-cooled, Elbridge marine engine of 60 hp After teaching himself to fly, he began barnstorming An accident early in his career "washed out" the ship and sent Cessna to a hospital for several weeks, but had absolutely no effect on his faith or courage. Scarcely had he regained his feet before he set about building another monoplane He completed and flew the second one and a third one before building the previously mentioned ship in Wichita

Up to that time all of the city's various aeronautical meets had been taking place on any field that might be deemed suitable for the occasion But immediately after the War the City Fathers began to look about for a piece of property to be dedicated to that purpose The Wichita Chamber of Commerce, which organization long before had begun to see the possibilities of commercial aviation, acquired use of the field adjoining the Jones factory, equipped it according to the modest dictates of that time, and early in 1919, through the efforts of Jack Turner, Elmer Reese, Marc Clapp, and other prominent Wichitans presented it for use as Wichita's first airport Just a few weeks later, on May 1, 1919, the Jones field was appropriately dedicated by 17 military planes participating in the Victory Liberty Loan Flying Circus

AT ABOUT that time a group of ex-army pilots went to Wichita, and with benefit of local capital, organized a company that was to mean much to the commercial development "just around the corner" The Wichita Airplane Company, it was called, and its purpose was barnstorming, joy-hopping, student instruction and taxi service Witchita Airplane's largest stockholder was none other than Jacob Melvin Moellendeck, popularly known as "Jake," and now called the "Father of Aviation in Wichita," a tribute, by the way, which he richly deserves Among other stockholders in the company were J H Turner, contractor, and George H Siedhoff, hotel proprietor, both of whom have large holdings in Wichita's present-day aircraft projects Joe Witt was the company's chief pilot and manager, and had charge of the concern's two Canucks and one Jenny. The company operated off a 40-acre field just outside the northeast border of the city, and not far from Jones Field. Today the site is occupied by Swallow Airplane Manufacturing Company

Jake Moellendeck migrated to Wichita from the East, via Okmulgee, Okla It may have been his earlier contact with Billy Burke in the Oklahoma town that instilled his faith in aviation However that may be, he found himself in Wichita working as a tool-dresser in the halcyon days of Kansas oil history, and acquiring a monetary interest in his "holes" whenever he could One day his bit plunged into "pay dirt" and a gushing mint of "black gold" transformed Moellendeck into a millionaire One of the very first things he did with his newly found riches was to back his faith in the airplane by investing heavily in the Wichita Airplane Company

With formation of Wichita Airplane Company, financed by men like Moellendeck, Turner and Siedhoff, Wichita had gained the foothold that subsequently enabled her to reach a lofty peak in the industry. The actual conditions that brought about that development will be delineated in a succeeding article.

A SURVEY OF PRIVATE FLYING

By James P. Wines

A particularly interesting and informative analysis of a survey recently conducted by AVIATION in the Chicago district

HOW ARE we going to sell more airplanes? That question is the aircraft industry's most interesting topic Under twentieth century conditions an industry can be said to have attained maturity when the problems of merchandising take precedence over those of design and production The manufacture of aircraft has reached that stage

In attempting to determine ways and means of selling more planes, the industry's first step is to ask itself: To whom are we going to sell? What type of individual is the most likely buyer? What will be his age, his tastes his character, and his income?

The representatives of one well-known airplane manufacturer are canvassing lists made up of all persons known to have annual incomes above a certain figure—a type of prospecting that will bring some results, for persistent door-to door solicitation will always develop a certain number of unexpected sales But the percentage of sales as a result of such shotgun methods is usually low

The use of a list based on income implies the supposition that the business time of a wealthy man is so valuable that he cannot afford to travel any other way than by air. Admitting that, in most cases the man whose sole interest is in saving his own time for business will find it more expedient to use regular air lines than to purchase a personal plane

IS SPEED the only attraction that the plane possesses? Is it the chief thing that motivates the purchase? For what purpose does the private buyer want a plane? What type does he want? Is private flying lagging because there are certain conditions existing that make the ownership of a plane undesirable to the average person? If

Above Flight picture of a Cirrus powered Avian owned by Chester Faust of Chicago

Fred L B Foale beside his Command-Aire which he uses for pleasure and business

so, then what are they and how may they be overcome?

In an effort to answer these and other questions, AVIATION has recently conducted a survey of private flying activities in the Chicago district The writer interviewed the owners of a number of individually operated aircraft and then to augment the information thus collected, sent questionnaires to a large group The investigation was limited to the neighborhood of Chicago because it was felt that city would well represent average conditions throughout the country and because confining the study to a limited field would make it possible better to gauge the personal element which enters into the sale of aircraft to the individual

Judging from the Chicago field, the typical private plane owner of the present day would seem to be a man in his early thirties He is something of a sportsman, an outdoor man by choice with a comfortable but not a large income, which he will usually say is actually inadequate for the support of a plane Business interests, or the fact that he is tied down to a salaried position greatly limit his flying time You will usually find him at the field on Saturday afternoon and all day Sunday

THERE is, of course, no typical occupation The plane owners are advertising men, junior executives artists, architects, publishers, brokers, printers merchants, newspapermen, manufacturers There is even a motorcycle policeman among them Some of them are well-to-do, but the average income of these men probably is not $8,000 a year There is one owner a young man in his twenties who has the income from a fund left in trust for him It is not a great deal but with the amount he earns it is possible for him to live modestly and at the same time operate a plane for his own amusement

These men fly because they like it Considering the responsibilities that some of them have they probably are justified in saying that they cannot afford to own planes, yet there is not one who plans to sell because the cost of operation is too high Less than half of them keep accurate cost records, none attempt to figure depreciation Subconsciously they do not want to know what it costs

Some of them turn their planes over to transport pilots at times for passenger carrying as an aid in defraying expenses One owner a former newspaperman now with an advertising agency has a job at the airport where he houses his plane He makes announcements over the loudspeaker system every Sunday during the flying season earning enough in that manner to pay for about three hours' flying a week When a man is willing to do that so that he may fly, clearly time-saving alone is not the reason for his owning a plane

Many owners, of course, maintain that they find their planes valuable in business but, nevertheless, use them principally for pleasure It is a question if many would be kept for business purposes alone although one man says he finds his plane so advantageous that he expects to purchase a faster one in the near future with which to make all his business trips

At this point mention might be made of another of the owners, who says he makes no use of his plane except in business Without question, it was speed that appealed to him when he purchased his craft His time is valuable, and he was going to buy a plane so that he could do more work and make more money He acquired the plane and then found that the airport and servicing facilities at those places where he wanted to land were seldom what they should be He purchased the plane, he said, "hoping to save time in traveling, but I'm not doing it, because of the poor ground facilities and rotten airports"

That man is not an aviation enthusiast If he were to receive a decent offer for his plane, he probably would sell But not one of the private owners, who flies just for the joy of flying, would sell his craft unless he could purchase a better one

From the figures obtained in the survey it appeared that the average plane owner does two-thirds of his flying for pleasure and one third for business Breaking down the figures farther, the following table was evolved

40%	solely for pleasure
22%	75% of time for pleasure
11%	50% of time for pleasure
22%	25% of time for pleasure
5%	for business

A further analysis shows that the real aviation enthusiast is spending considerably more hours in the air than the man who purchased a plane to save time The hours per year of those who fly primarily for pleasure exceed by about 50 per cent the figure for the private pilots mainly on business bent

The average monthly flying time of the privately owned plane is only 13 hr and 24 min, or 160 hr a year That is something which should cause concern, for it means that the ordinary private pilot will not wear a plane out He will become dissatisfied with it and feed it back into the used-plane market long before the extent of its usefulness is reached The plane owners themselves realize the fact One of them interviewed remarked that he would want a new plane in a year or so He knew that his present plane, unless he cracked it up, would be quite serviceable for a number of years to come, but he supposed that he would receive a demonstration of a new one, and there would be nothing to do but trade in the old one on the improved model

A Sikorsky S-38 owned by Charles R Walgreen on the line

A view of the private club room in the administration building at the Pal-Waukee Airport

It is only natural that the owner should want the best performance obtainable The old plane will seem sluggish, even though it may be in almost perfect condition after a demonstration of a new one The aircraft industry is headed for a trade-in problem probably more acute than any experienced by other industries Up to this year it has been of little importance The present survey revealed that 80 per cent of Chicago's privately-owned planes were new when purchased and that 20 per cent were used

The operation of an air line has often been likened to that of a railroad the private plane to the automobile Neither analogy rings perfectly true The airplane is different from anything we have known before But isn't the ownership of a plane more like that of a motor boat than anything else? We expect to hear loud cries of "No, No," from advocates of the theory that planes will eventually become more common than automobiles However, the similarity is being recognized by airplane manufacturers who are already making efforts to appeal to yachtsmen through the yachting magazines

Let us make a comparison The plane, like the boat must operate from one port to another Before the owner of either can make use of his possession, he must go to the airport or the harbor Then, before he can get under way for a sail, or a hop, as the case may be, there are certain things that must be done With the power boat, the owner must get out to the anchorage in a tender, bilge water must be pumped out, fuel and oil must be checked, and if there is not a sufficient supply, preparations made to take more abroad, the engine must be turned over and seen to be operating properly, the moorings must be dropped; and, after all this, a trip to the dock may be necessary to pick up supplies or guests

With a plane, it is necessary to have it taken out of the hangar, to make an inspection of the controls, control wires and landing gear, if the owner believes the old adage that in a large proportion of serious aviation accidents the occupants were dead before the plane left the ground, gasoline and oil must be checked, and the engine warmed up In either case, the work requires about half an hour Of course, the man with the professional crew aboard his yacht is not troubled with the details of getting under way, neither is the individual who can afford to engage the services of a pilot or a mechanic for his plane

Speaking of the employment of professionals, 28.6 per cent of the private plane owners included in the investigation employ professional pilots, which is higher than might have been expected However, it must be remembered that the figure includes student pilots who are plane owners Forty per cent of those who hire pilots fall into that classification, 40 per cent are non-fliers, and only 20 per cent are license-holders in their own right but still retain the services of a professional

It might be well to call attention here to the fact that service for aircraft is going to be an important factor particularly in regard to sales The motor boat analogy may be cited again The number of boat owners has increased tremendously in the last few years, but it has grown most rapidly where all the yachtsman has to do is to call the yacht club and give instructions to have his boat ready at the time he wants to take it out The aircraft industry has an edge on the motor boat industry in this respect, but it is not being played to its fullest

Service is being rendered at some airports If the owner telephones and asks to have his plane ready, it is checked completely and is on the line with the engine turning over at the specified time All the owner has to do is to give it a cursory inspection and take off At other ports it is complained, the owner will arrive at the field only to find his plane is still at the back of the hangar The delay is naturally annoying, and it may easily be that the delay proves to be at its worst on the day when the owner has brought a friend with him in an attempt to show him the joys of owning a plane

THE MOST popular type of plane with the private owner, as covered in the Chicago survey, is the 3-place open cockpit biplane, equipped with landing gear In spite of the city's twenty-six miles of lake frontage, only one man admitted the ownership of a set of seaplane floats for his craft He is a former yachtsman Nevertheless, his plane is kept on wheels the greater portion of the time There are some amphibions, owned by persons who are decidedly well-to-do

The average plane owner would like to do some over-water flying, but the large amphibions are too costly for his pocketbook and he feels that the usefulness of the

out-and-out seaplane is too much restricted. The development of the small amphibian, the majority agree, would be a happy solution to their own problems and should do wonders in popularizing private flying near any large body of water.

A comparison of the number of privately owned planes of various types included in the survey is given below in percentages:

	Per Cent
Monplanes	6
Sesquiplanes	5
Biplanes	89
Landplanes	95
Seaplanes	0
Amphibions	5
Open planes	86
Closed planes	14
Two seaters	28
Three seaters	62
Over three seats	10
Single engined	95
Twin engined	5
Multi-engined	0

One may jump at the conclusion that the majority of the privately owned craft are of the 3-place open cockpit variety because that particular type is the least expensive—that the private individual has selected it not from preference but from the standpoint of cost However, the argument does not hold water If the selection were made primarily upon a cost basis, one might expect to find most of the planes powered with OX engines In stead, it was found that only 43 per cent of the power plants develop 150 hp or less The same percentage have from 150 to 225 hp, and 15 per cent are over 225 hp Again, if cost were the only consideration, there probably would be no Lairds, Stearmans or Vought "Corsairs" in the list

The widespread choice of the open-cockpit plane is simply another indication that the private owner flies chiefly for pleasure It appeals to his sporting instincts He likes the open cockpit, because it makes the whole world seem his domain He likes the smell of the exhaust and the wind in his face The open plane appeals to him for exactly the same reasons that the high-speed open runabout appeals to many boating enthusiasts The only difference is the substitution of spray and the smell of the water for the slipstream and the exhaust.

The majority of the airplane manufacturers are now concentrating their efforts on the production of cabin craft; and they are on the right track even though the greatest proportion of privately owned planes at the present time are of the open type But it must not be expected that the cabin plane will supersede the open model Each will have a definite appeal, and here, again, we make a comparison with the motor boat The manufacturers have found that by fitting up their craft with much glass to protect those aboard from the full onslaught of the elements, with cabins containing almost every device included in the model home, and with steering wheel and other controls as much like automobile fixtures as possible the power boat could be made to appeal to the older man, with a resultant increase in the volume of sales The cabin plane may be expected to become popular with the same class of owner The sportsman is still favoring an open cockpit both on the water and in the air

Doubtless many in the aircraft industry would feel that the prospects for its future are not particularly bright if the chief use of planes, so far as the individual owner is concerned, will be for pleasure Yet the motor boat industry did a business of $60,000,000 in 1929, and that does not include the number of sailing craft that were built and sold If the aircraft industry does that well in the sale of its products to private individuals, there should be no cause for worry, considering the other markets that are available

Many of the manufacturers in attendance at the Aeronautical Chamber of Commerce meetings held at the time of the St Louis show, felt that some of the regulations laid down by the Aeronautics Branch, Department of Commerce, are hindering the growth of private flying The chief complaint voiced concerned the ruling that only persons holding pilots' licenses or student permits may be allowed to handle the controls of an airplane, and the fact that a physical examination is a prerequisite for the issuance of a permit Objections were raised also to the time element involved in obtaining the student license. The private plane owners interviewed, to a man, favor the retention of the present regulation

Aviation clubs of the Aviation Country Club type are fine for the man with considerable money, the plane owners agree However, the cost of maintaining a membership in an organization of that sort, in addition to the upkeep of a plane, is too much for the average person They recommend, as one of the best means for the promotion of private flying the organization of a large number of flying clubs of the type that maintain planes for the use of members, but do not go in heavily for the social side of club life Something like those for which the N.A A plan was particularly formulated

MANY of the private fliers believe the real solution lies in the hands of the airport operators Surroundings at the average field are far from congenial, sometimes that the Aviation Country Club organization has played up in its membership drives Flying inherently is not a social sport A man must do it alone For that reason, a congenial atmosphere should be provided for him when he is on the ground, the owners say There should be lounges, dining rooms, and lockers The arrangements do not necessarily have to be elaborate, but they should be comfortable

Quite a number of the craft owned by Chicagoans are now housed at the Pal-waukee Airport The management is planning to provide quarters especially for the plane owners which will serve for all practical purposes as club rooms in a new administration building that is to be erected

The length of time it takes to learn to fly has been a handicap to the growth of private flying according to the private pilots This is especially true, they say, in the large cities where the airports are quite some distance from the business section Some say, too that the cost of instruction is too great, just as others maintain the price of planes is too high They advocate having the dealer give instruction, the cost to be included in the price of the plane

Finally, nearly all of the plane owners agree that private flying has not advanced as rapidly as it might have because there is too much mystery surrounding it—too much talk of the difficulties encountered in learning to fly and the necessity for being a "super-man" They say that anyone can learn to pilot a plane and until the public is made to realize that flying is easy, the sale of aircraft will be definitely limited In that, the correctness of their judgment is beyond question

FLYING CLUBS AND AMERICAN AVIATION

By Charles H. Gale

Assistant Editor of AVIATION

What is the matter with the flying club movement in this country? In this article Mr. Gale reviews the situation and points out many interesting facts that warrant the attention of the entire industry

PRIVATE flying in this country falls into two classes First, flying done by individuals able to own and operate their own craft Second, flying done by individuals banded together to share the expenses The latter has been designated as a flying club, although more and more the flying club may take on the attributes of a co-ordinating agency among a number of individual owners, as well as a co-operative ownership of aircraft

Like everything else connected with aviation, the flying club received a great impetus in the 1927 1928 period and hundreds of groups launched themselves into the air on a co-operative basis only to find that phenomena resembling spins and stalls of actual flight occurred in financial operations as well We come now to the fall of 1930 and wonder what has been accomplished in the flying club field during the last few years and what its prospects are for the future

We can say at the outset that the flying club movement has not prospered It has not "clicked" in the aeronautical industry and does not command the respect, or perform the service which might reasonably be expected of it as a means of engaging in private flying at a reduced cost Looking back over the years we see the wrecks of many planes and of many clubs the life of the club all too frequently coinciding with the plane's life

However, the picture is not as black as it at first seems, for as a matter of fact the flying club as a movement has not really been given a real trial in this country. It is only fair to point out, too, that most of the flying clubs do not qualify under a strict definition of a club, many of them being organized on a straight co-operative ownership basis without any pretense of the other features which go to make up a real club However, at this stage of development further distinction between these two types is unnecessary

The backwardness of the American flying club movement is most unfavorable in the face of the flying club record throughout the British Empire The clubs prosper in Canada, which is close to us geographically and which is composed of a public resembling us in their attitudes and policies It is true that there exists one fundamental difference between the American and British systems—that of federal subsidy—but it is questionable if that can explain entirely the present situation At any rate, the British clubs have become the back bone of the British civil aviation and it prompts the question if we are not probably overlooking a very important department of aviation activity

Flying clubs in this country have taken on four general types These are:

1 The independent, unassociated group which has been developed in any number of communities in the last two or three years, as a result of the general upswing of interest and faith in aviation

2 The club developed by various aircraft manufacturers, whose primary interest, of course, is the sale of a plane to the groups involved

3 The private club which the National Aeronautic Association has conceived in accordance with its private flying club plan

4 The aviation country club type, based definitely upon premises of wealth and social position

The five main elements of any co-operative effort are: (1) The financial and organization structure (2) The social relations obtaining (3) The administration of the unit (4) The degree of influence of external agencies such as a government, or a co-ordinating association of clubs, etc

Financing is the most important of these More flying clubs have crashed on account of structural failures in this respect than from any other cause The movement in this country followed that in England by a number of years and the English experience would have been a far more valuable precedent had the subsidy system with its artificial support not been involved This subsidy has been the mainspring of the English clubs and, as we know how to operate aircraft and ad-

minister an organization, the chief difference between American and English clubs lies in the lack or presence of a subsidy, as the case may be

The chief problem for the American clubs then, is the development of a financial scheme which will make the clubs a working organization without the aid of this substantial assistance There is no hope of the American clubs ever enjoying from their government any such aid and so it is imperative to learn to get along without if the flying club idea is to survive and prosper in accordance with its promise A number of attempts have been made to have the federal government co-operate with the American clubs through a subsidy, notably the effort of the American Society for the Promotion of Aviation, but nothing has ever come of it

The form of attack upon this problem during the last few years has varied as follows

THE individual unattached club, mentioned above, has been organized on a "shoestring," that is, without a guarantee of loss replacement It has been forced to function with limited resources right from the start and therefore everything that was not directly essential to operations has been eliminated This means that the group is playing with something a bit beyond its means but is willing to risk the loss of time and money as well as the plane in case the machine is destroyed It is a laudable spirit but a regrettable condition It is uneconomic to have such a risk suspended over a group with no safeguard against its heavy investments of time and money However, far be it from me to say to a group that it had better not organize at all unless it can protect its interests with some kind of insurance I was a member of such a club myself not so many years ago and it is entirely right that the group operated Certain things were accomplished to the benefit of individual members in their aeronautical career and also of the community Complete insurance was impossible to get for a club in those days

This was the Flying Club of Springfield (Mass) which has now become a member of the N A A but not as a flying club chapter This club had an initiation fee of $100, annual dues of $25, an instruction fee of $15 per hour and a solo fee of $7 50 per hour Net income sufficient for paying running expenses small repairs, periodic overhaul of engines, hangar accommodation and servicing, original purchase of the first plane and replacement of the plane at the end of two years was to be derived from this set-up

There is every indication that a prosperous career would result A few complications, common to many clubs and of such a nature as to cast serious reflections upon the soundness of this particular plan, arose in the history of this club In the first place, the above figures were based on a minimum of 25 regular or flying members and that number never was secured placing an additional burden on the balance In the second place there was not anywhere near a sufficient volume of use of the plane to enable the plane to earn its way, a serious economical shortcoming Thirdly, the plane was washed out through an unavoidable accident, from which the pilot escaped without injury, and the fate of many another club was repeated—flying ceased as a club function

The point should be made, however, that flying most likely could have been carried on had there been sufficient *interest* to replace the equipment For instance it was included within the club regulations that a pilot should

Typical Curtiss-Wright Flying Club Set Up

Cost Gipsy Moth	$4 000 00
Average Delivery Charge	100 00
Average Complete Insurance at 22%	880 00
Total to be collected by the Club	$4 980 00
Initiation fee per member	$200 00

(The initiation fee is an investment which can be sold when a member withdraws from the Club)

Club Dues Cover the Following Fixed Expenses

(Based on 500 Hours Flying Yearly)

Cost of Airplane $2 400	
Life of Airplane: 2,000 Hours	
Reserve for Depreciation	$600 00
*Annual Overhaul	350 00
Cost of Engine $1 600	
Life of Engine 2,000 Hours	
Reserve for Depreciation	400 00
Reserve for Overhauls	
*Top Overhaul (Every 300 hours at $100)	100 00
*Major Overhaul (Every 600 hours at $300)	250 00
Normal Repairs and Maintenance	
*Airplane and Engine	500 00
*Insurance Reserve for following year at 22% of $3 250 00	715 00
*Hangar Rent, per month $25 00	300 00
	$3 215 00
Club Dues per member (monthly)	$11 00

Hourly Operating Cost

Gasoline 6 gals per hour at 30 25 per gal	$1 50
Oil ½ pint per hour at $1 20 per gal.	07
	$1 57
Dual Instruction per hour	$5 00

First Year Flying Cost per Member

10 Hours Dual	
Instruction at $5 00 per hour	$50 00
Gasoline and Oil at 1 57 per hour	15 70
10 Hours Solo	
Gasoline and Oil at $1 57 per hour	15 70
Flying fee $5 00 per hour (20 hours)	100 00
Dues of $11 00 per month (12 months)	132 00
Grand Total.	$313 40

*Hangar rent, overhauls, service and insurance may vary, within narrow limits according to local conditions.

replace equipment damaged in proportion to his culpability Most of the individuals in the club were financially able to do this even to the extent of a new plane In this case a payment was made to the club to satisfy the claim However there seems to be so much indecision among the flying members about assuming the responsibility of resuming flying and there is such a strong disinclination among the other members to share responsibility for equipment they do not use, that nothing to date has happened

That is one typical example of the shoestring type of club Another which merits mentioning because it deliberately avoids participation in the N A A plan on the ground of expense is that of the District of Columbia Air Legion This club has operated for two years, has survived in good shape three serious accidents and asserts it is entirely satisfied with its plan for taking care of all such club crises

This club was organized in March, 1928, started flying in November, 1928 and has owned three planes, none of which have been damaged beyond repair Most of the accidents involved only propellers, undercarriages and wing tips However, one mishap cost $800 and the other $700 to put the plane back into flying condition

The method of financing these emergencies is as follows: A large membership (110 paid up at this report) with flying membership fee of $10, annual dues of the same amount and an associated membership costing half as much in each item The instruction fee is $15 per hour and the solo fee $10 per hour The unique feature, however, is the plan of having each member put as much money as he feels able in the treasury as an advance payment on flying time When he takes instruction he is charged for half of the fee while the other half is deducted from his advance payment

Under this system the club is claimed to have been solvent at all times throughout its career That there is plenty of patronage of the club equipment is shown by the report that there are three transport pilots, sixteen private pilots and 50 student pilots Forty of the club are flying solo

The club claims that the N A A plan is too expensive and that, operating with a large membership and low dues with the advance flying time payment in effect, the financial side is taken care of It is more economical the club says, to replace a damaged plane with a moderately priced machine than to invest in an insurance scheme. A series of misfortunes in quick succession would defeat this system, it seems

Still another outstanding member of this type of flying club is the Harvard organization The Harvard Flying Club with its five years of successful operation without the backing of insurance probably has been used as a model more than any other individual club This club was started in 1925 and its main preparation against loss of the major investment—the flying equipment—was a rational but strict set of operating rules.

A FLYING club devised by the manufacturer, type 2, presents an interesting example of the way the flying club idea in this country has been misunderstood While it is only fair to say that a strong club established under the sponsorship of a manufacturer is another dependable link in the chain, still the fact that the manufacturer took the trouble to make that club possible merely as a sales channel is a misplacement of emphasis In other words, it is not the club and all its possibilities with which they are concerned, it is the sales record

Most of the companies having a sales plan report that they have but recently started the idea or frankly state that it has not proven particularly potent Among those having a flying club plan are the Curtiss-Wright Flying Service, Waco Aircraft Co, Swallow Airplane Co, Nicholas-Beazley and the Great Lakes Aircraft Co Curtiss-Wright is just getting its plan under way Swallow does not consider the plan much of a success, and the Great Lakes plan really coincides with that of the N A A

Waco considers its flying club plan a success and lists about 30 clubs to which its planes have been sold Whether or not these groups still are functioning could not be determined The company does not believe that the clubs are growing, which means that they probably have not been established on a permanent basis and serves chiefly as a co operative purchase plan The Waco report stated that it was doubtful if many of the clubs carried insurance

Curtiss Wright is just getting started on its flying club plan and a number of clubs have been formed already The financial set-up of this plan includes free insurance coverage There are two sets, one for a club adopting a Moth as the club plane and another for the club adopting a Robin The set up for the Moth (with 25 members) is tabulated on page 176

Complete insurance is provided also by the Nicholas-Beazley Flying Club Association and the Great Lakes plan which is affiliated with the N A A Nicholas-Beazley presents the total cost for each member according to the total number of members composing the club For instance, in a club of ten members each individual would pay $530 This would include cost of all equipment, insurance and 15 hr, flying It costs proportionately less for a fifteen- and twenty-member club No report has been forthcoming from this company, so it is not possible to say what degree of success this plan has met.

THE N A A adopted a private flying club plan two years ago in the belief that such organizations offered the logical medium for the evolution of private flying in this country The N A A still believes in the plan, although to date but three clubs have acceded to it and operated in accordance with its provisions The originators of the plan were inspired by the excellent work done by the English clubs and were guided to a great extent by their organization The problem was that of revamping the tried and true English system to fit into the conditions obtaining in the American field

The bone of contention was, of course, a method by which the clubs could be established on a permanent basis and be assured of continuity in their operations despite the common flying club bugbear of a washout. Complete insurance coverage at a not too exorbitant rate was the goal Negotiations brought about an arrangement which made possible complete coverage at about 25 per cent of the cost of the flying equipment

This operates as follows

The individual members contribute sufficient money to cover the cost of the flying equipment plus a reserve of 25 per cent of that cost and an additional $200 for general operating expenses With a plane costing $4,500 this original investment would be $6,000 It is recommended that dues be $15 for flying members and $25 for the non-flying members, and that solo time be charged for at the rate of $10 per hour

Insurance is granted with the understanding that operations will all be conducted in accordance with standard safety rules With a plane costing $5,000 a club of ten members would have to pay 25 per cent—$125 each—for the coverage This cost goes down with the size of the membership With 25 members the per capita cost would be only $50 The insurance provided gives protection against all crash damage beyond the first $300 in any single crash, protects the club and individuals against liability to the public up to $20,000 for injuries to any one individual and up to $40 000 for any one accident, and protection against all claims for damage done to property of others up to $10,000 Legal expenses are included.

These figures were derived from a theoretical flying club chain of twenty individual clubs The high cost involved is frankly given by the N A A as one of the main reasons for failure to achieve an appreciable proportion of these to date. However it feels that another reason is the lack of appreciation of what may be accomplished under the protection of this insurance and believes that a campaign of education will stimulate its acceptance

The main feature distinguishing the N.A.A. plan from the shoestring type of club is this insurance arrangement.

The Aviation Country Clubs plan is premised from the outset on wealth and social position. This is an association which hopes one day to have a national chain of units available for its members wherever they may happen to be. Members belong to the Aviation Country Clubs and become affiliated with the local unit, as in the case of the Long Island club at Hicksville.

There are 205 members affiliated with the Long Island unit. The membership is set up as follows:

Class	Membership Fees	Annual Dues
Proprietary	$1 000	$150
Adult active	500	150
Junior	50	25
Non-resident	50	10
Service (Army, Navy)	50	25

All members have the same privileges which includes the clubhouse facilities as well as the flying equipment.

The club completed its first year July 1 and the following figures were reported:

Income from flying operations	$16 294 52
Income from rental of hangar space	13 775 94
Income from the club house	22 189 70
Income from membership fees and dues	31 250 00

Instruction through the club costs 33 per cent less than at the average Long Island field. Hangar space costs 20 per cent less and expert plane and engine inspection is about 50 per cent under the current rates. During the first year of operations, however, due chiefly to $12,000 improvements to the field, the club did not quite break even.

Members now are given instruction at the rate of $10 per hour on a Moth or Avian and $15 an hour on J-6 Travel Air. The club owns a Moth, an Avian and a Fledgling. Members bought 54 planes during the first half of the fiscal year and 36 during the second half. Plans are progressing for additional units at Westchester, Cleveland, Chicago, Red Bank, N. J., and Philadelphia. Bids have been received already for construction of a plant at Long Ridge, Conn., for the Westchester club.

This plan appears to have met with success as far as one unit is concerned. A fundamental of the scheme, however, is the existence of a chain of units, which has not been set up as yet.

There are several interesting observations to be made about this Long Island club. The membership fees may be considered exorbitant in comparison with many other flying clubs. (They are much above the average yacht club, of course.) However, the average flying club does not have the extensive airport (in this case it is a completely lighted field and much night flying is carried out) nor is there a hangar and clubhouse to manage.

On the other hand, financial soundness is derived from the income these facilities earn. And these in turn depend directly upon the volume of use made of them. Apparently there is a sufficient response here. The club-owned planes were flown 740 hr. during the first year and as stated above the income they earned totalled $16,294.52. The income earned by the clubhouse indicate generous patronage there.

The English subsidy system at first was as follows: Each club was given two planes and an extra engine and the balance in cash between the cost of this equipment and $10,000, a first-year grant of $5,000, an agreement that the Air Ministry would pay half the cost of the machine in event of a washout; $50 for each student to gain the "A" certificate. Half of this sum was refunded to the student by the club. This agreement was to run for three years and in 1927 the terms were changed to give payment on the basis of results. The second system is: Payment of $250 for every pilot qualifying for either an A or B certificate, $7.50 for each hour flown by an A or B pilot up to a maximum of 20 hr., and a grant of $50 for each member holding an A or B certificate on the previous January 1. The grants to any one club were not to exceed $10,000 in any one year. The direct subsidy is to be withdrawn this year.

In most English clubs the instruction fee is $10 per hour and the solo fee is $5 per hour. The average cost for instruction up to and including the A license is $200.

These, briefly, are the methods which have been derived in this country to operate from the financial point of view. The magnitude of the problem as compared with the English system is obvious from the last few paragraphs. Under the best of circumstances the American club must pay more for its flying fun than the Britisher, although we may find next year, when most of the English clubs will be operating on their own, that we have overlooked a few tricks after all. In order to secure continuity of operations we must have some sort of an insurance coverage or its equivalent, which, frankly does not loom on the horizon as yet. It should be pointed out that the 25-club N.A.A. chapter need impose on each individual an annual tax of but $65, including the insurance fee, after an original investment of $240 with a $4,600 plane.

Having discussed the financial angle of the problem we have covered the most important element. However, a number of points deserve special mention. One of these is the matter of social activities under club auspices. Most flying clubs in this country lack a social program or facilities for social activities and thus become in reality a partnership group in the ownership of a plane rather than a club in the true sense of the word.

THE English clubs feature this angle and it is a fundamental rule that for each club there shall be some sort of a clubhouse or at least a room which will serve as the focal point of the members. The Aviation Country Clubs has emphasized this idea and much is made of the social side of its operations. This may be more elaborate than would be possible or even desirable for the average group, but the fact remains that some sort of club quarters, whether in a separate building or one corner of a hangar, is the key to club homogeneity—a feature to be promoted second only to the flying program. So important does this seem that it appears club headquarters should be provided at almost any cost. As in the case of the Long Island club it may become an important source of revenue although on a more modest scale. The average American club lacking this club feature misses one of its best means of attaining strength and prosperity.

In union there is strength and for this reason an association acting in a co-ordinating and advisory capacity offers certain conspicuous advantages. The operation of the English clubs is helped immeasurably by the existence of federal supervision as well as by the direct financial aid. The N.A.A. and the Aviation Country Clubs enjoy the benefits of an association. For instance, it is on the basis of this co-ordination that lower insurance rates are obtainable under the plan. Again, the full effect of this superstructure cannot be measured as yet because in no case in this country has it been tested to any

extent. It can be stated confidently, however, that individual clubs may expect a happier time of it when united in a broad, perhaps national, association than when struggling along alone.

Still another of the main elements of any club is the type and effectiveness of its administration set-up. As explained before many clubs have adopted strict regulations as their best form of insurance. Even lacking complete insurance coverage, a club must be operated on as careful a basis as possible in order to protect its members against the mishaps which constantly threaten. No type of insurance will replace a broken neck, even though the smashed plane may be replaced almost immediately by a new machine.

The record of the Harvard club in this respect indicates what can be done when painstaking supervision of operations is maintained. This does not necessarily take all the joy out of the sport, either. The affairs of the Aviation Country Clubs at Long Island have been so well administered that there have been no accidents of any consequence to planes cared for by the club and while operating under the club regulations.

The general character and psychology of the group comes into play here. Under-trained and over-zealous individuals who fail to appreciate the vital characteristics of keeping the plane and engine constantly in excellent condition, of observing rational flying rules and maintaining in general high standards of training, etc., are those most likely to get into trouble. They are among those most likely to count the life of the club in weeks or months rather than in years.

THERE is a vast difference between the conception of the flying club in this country and abroad. Our outlook on this flying game is chiefly commercial. This twist is natural but it is not conducive to promotion of flying as a sport. It is true that provision is made in the federal aeronautical structure for private and sport flying but it is quite secondary to the business of making a living by the industry. This accounts for the tendency to consider flying clubs merely as sales outlets or of a co-operative way of achieving a commercial license at as low a cost as possible.

An important point is that the English clubs are complete, individual units. They have their own hangars, their own instruction and mechanical staff and thus create a self-sustaining organization. In this country the average club is dependent on a commercial operator for maintaining and housing the club equipment and for instruction. The commercial operator's interest in the group is secondary to his own company and he often looks upon it as a rival in the matter of securing students for his flying course, etc. It is obvious that an American club has greater difficulty thriving under such conditions. The Aviation Country Clubs plan provides for a complete unit and at Long Island there is a manager of operations who gives full time to the supervision of flying and instruction and who has a staff of six mechanics and two field men.

It is interesting to note, too, that the flying club idea has not taken hold in two of the most important of this country's aeronautical sections—Los Angeles and Detroit. The report from Los Angeles is that while California is a club-loving country—having no end of yacht, riding, polo, hunting and fishing clubs, etc.—there is not one outstanding flying club. As has been all too common in other sections of the country, so-called club flying has been for the most part a cheap means of securing flying time for the sake of a license which will permit flying for a salary. The club features have been sublimated.

In Detroit we find that there is little or no activity along this line and the three or four promising clubs organized within the last few years at the present time are practically stagnant.

Another fundamental to success is adequate use of the club facilities, especially the club planes. These must be made to earn their way and those in charge of operations must see to it that the minimum number of hours put in, figured in relation to the flying charges and the club's income budget, is maintained. As soon as the usage drops below the minimum, steps should be taken to correct the situation, for this means that one of the most important sources of revenue is dropping away.

It is highly desirable that clubs be organized on the basis of a complete unit with its own staff. This requires more investment and a larger membership than the average but these are compensated for by the increased club consciousness, etc. This is one of the experiments which has not been given full trial in this country. Judging by the examples available such a plan is extremely promising.

WE NEED a new concept of what the flying club offers. Perhaps we need to think of the club more along the lines of a country club, even a community project. At any rate we should get away from the attitude that a flying club consists of a small group, usually on the verge of bankruptcy, whose faith is pinned on the performance of a single plane and without any tangible means of continuing the group's flying activity should adversities set in. We should particularly get away from the idea of the flying club as merely a means of getting in flying time for the sake of a commercial rating at lowest possible expense. It cannot help but operate that way with many individuals but such a concept should not dominate.

Flying club organization from a community basis has been suggested and it certainly merits trial. Perhaps one day communities will see the advantage of such a flying club as they have seen the benefit of airports. The latter are more obvious to the collective eye of a community, making its development more easy. The flying club should not be thought of only in terms of a flying school either. It would function as such but it should become after the first part of its career a means for its members to engage in flying for sport at a favorable cost. At first glance it may seem paradoxical for the Curtiss-Wright Flying Service to be encouraging flying clubs lest their existence detract from attendance at its flying schools. Curtiss-Wright frankly admits that it expects the club will appeal to an entirely different set of persons, that the embryo pilot will continue for the most part to go to its schools, especially if he is in search of a commercial license and that men interested primarily in sport flying, including war-time pilots anxious to keep their hands in, will take advantage of the club.

We cannot say the flying club plan has failed in this country, for with few exceptions it has not been given a fair trial. Those exceptions indicate that great possibilities are in store. The whole movement awaits the education of the average aviation supporter to a new idea of what a "going" flying club is and what its place may be in the complete aeronautical picture. The principles outlined above will be among the main points through which the golden era of the flying club in this country may come.

DAILY PROGRAM OF EVENTS AT THE AIR RACES

Tentative program of the 1930 National Air Races at the Curtiss-Reynolds Airport, Chicago, Aug. 23 to Sept. 1

Saturday, August 23

Flag Raising Inaugural Ceremony Army Pursuit Planes Event No 26—Civilian Open Planes—1 800 cu in Navy Planes Al Williams and Foreign Pilots Event No 45—Sportsman Pilot Race—275 cu in Marine Corps Planes Al Williams and Foreign Pilots Balloon Bursting Arrival Men's Class "B" Pacific Derby Civilian Acrobatic Exhibition Towed Glider Flight (Capt Hawks) "Jimmy" Doolittle (Mystery Ship) Pusher Plane Flights. Parachute Jumping Contest. Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys. Fireworks Anti-Aircraft Barrage

Sunday, August 24

Glider Contests and Demonstration Flights Men's Dead Stick Landing Contest. Balloon Bursting Contest Women's Dead Stick Landing Contest. Flag Raising Event No 3—Army Pursuit Race. Event No 44—Sportsman Pilot Race—1,000 cu in Navy Planes Event No 27—Civilian Cabin Race—1,000 cu in Army Pursuit Planes Civilian Acrobatic Exhibition. National Guard Race—Liberty Engine Trophy Race Arrival Men's Class "B" Atlantic Derby Marine Corps Planes Towed Glider Flight (Capt Hawks) "Jimmy" Doolittle—Mystery Ship Army Bombing Squadron Maneuvers Al Williams and Foreign Pilots. Pusher Plane Flights. Army Pursuit Planes Parachute Jumping Contest Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys. Fireworks Anti-Aircraft Barrage

Monday, August 25

Model Plane Contest and Demonstration Flights Glider Contests Men's Dead Stick Landing Contest. Balloon Bursting Contest Navy Planes. Flag Raising Event No 5—Open Planes—275 cu in Army Bombing Squadron Maneuvers Event No 25—Free for-All for Men—1 500 cu in "Jimmy" Doolittle—Mystery Ship Arrival of Women's Pacific Class "A" Derby Event No 4—Marine Corps Race Arrival of Men's Pacific Class "A" Derby Towed Glider Flight (Capt Hawks) Event No 10—Men's Open Plane OX5 Race Civilian Acrobatic Exhibition Army Pursuit Planes. Woman's Dead Stick Landing Contest. Pusher Plane Flights Al Williams and Foreign Pilots Navy Planes Maneuvers Frank Hawks—Mystery Ship Parachute Jumping Contest Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys Fireworks. Anti-Aircraft Barrage

Tuesday, August 26

Model Plane Contest and Demonstration Flights Glider Contest Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Event No 11—Men's Cabin Plane Race—OX Army Pursuit Planes Event No 35—Men's Speed and Efficiency Cabin Planes—800 cu in Civilian Acrobatic Exhibition Arrival of Women's Dixie Derby Class "B" Navy Plane Maneuvers Event No 12—Men's Open Plane—350 cu in Signals Parade and Salute Jimmy Doolittle—Mystery Ship Event No 19—Men's Cabin—550 cu in Marine Corps Maneuvers Al Williams and Foreign Pilots Army Bombers. Pusher Plane Flights Towed Glider Flights (Capt Hawks) Three Navy Planes Parachute Jumping Contest. Band Concert and Demonstration Flights. Army Navy and Marine Corps Night Flights. Three Fireflys. Fireworks Anti-Aircraft Barrage

Wednesday, August 27

Model Plane Contest and Demonstration Flights. Glider Contests. Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Civilian Acrobatic Exhibition Event No 2—Women's Cabin Ship—550 cu in U S Navy Race. "Jimmy" Doolittle—Mystery Ship. Event No 42—Sportsman Pilot Race—650 cu in Pusher Plane Flights Event No 6—Men's Cabin Plane Race—275 cu in Al Williams and Foreign Pilots Event No 15—Men's Open Ship—450 cu in Marine Corps Planes. Towed Glider Flight (Capt Hawks) Army Pursuit Ships Navy Maneuvers Army Bombers Parachute Jumping Contest. Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights. Three Fireflys Fireworks. Anti-Aircraft Barrage The non stop air derby from Los Angeles to Chicago is scheduled to arrive before 6 00 p m weather permitting

Thursday, August 28

Demonstration Flights Glider Contests Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Event No 3—Men's Free for All—510 cu in Army Pursuit Planes Event No 1—Women's Open Plane Race—500 cu in Navy Maneuvers. Event No 23—Air Transport and Efficiency Race for Men. Civilian Acrobatic Exhibition Event No 40—Sportsman Pilot Race—350 cu in Signals Parade and Salute Jimmy Doolittle—Mystery Ship Marine Corps Planes Al Williams and Foreign Planes. Event No 22—Men's Open Plane Race—800 cu in Towed Glider Flight (Capt Hawks) Pusher Plane Flights Army Bombing Planes. Parachute Jumping Contest Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys Fireworks Anti Aircraft Barrage

Friday, August 29

Demonstration Flights Glider Contests Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Event No 7—Men's Free-for-All—275 cu in. Navy Maneuvers. Event No 34—Women's Open Ship Race—800 cu in Army Bombers Event No 13—Men's Cabin Ships—350 cu in Civilian Acrobatic Exhibition Event No 43—Sportsman Pilot Race—500 cu in. Marine Corps Maneuvers. Towed Glider Flight (Capt Hawks) Jimmy Doolittle—Mystery Ship Event No 18—Men's Open Ship Race—650 cu in Army Pursuit Planes Al Williams and Foreign Pilots Pusher Plane Flights. Frank Hawks Mystery Ship. Parachute Jumping Contest Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys Fireworks Anti Aircraft Barrage

Saturday, August 30

Demonstration Flights Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Event No 14—Men's Free-for-All—350 cu in Civilian Acrobatic Exhibition Event No 36—Women's Cabin Ship Race—800 cu in Navy Planes. Event No. 10—Men's Cabin Race—450 cu.in Army Pursuit Flights Signals Parade and Salute. Event No 24—Men's Free for All—800 cu in Marine Corps Towed Glider Flight (Capt. Hawks) Event No 30—Men's Multi-Motored Plane Race Al Williams and Foreign Pilots. Army Bombers "Jimmy" Doolittle—Mystery Ship Pusher Plane Flights. Parachute Jumping Contest. Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys. Fireworks. Anti Aircraft Barrage.

Sunday, August 31

Demonstration Flights Glider Contests Cleveland Derby Leaves (Mixed Doubles Relay Race) Dead Stick Landing Contest for Men Balloon Bursting Contest Women's Dead Stick Landing Contest Flag Raising Army Bombers Event No 17—Men's Free for-All—450 cu in Navy Planes Towed Glider (Capt Hawks) Amphibion Planes Leave Civilian Acrobatic Exhibition Marine Corps Amphibion Planes Finish Race Frank Hawks—Mystery Ship Event No 22—Men's Cabin Ship Race—800 cu in "Jimmy" Doolittle—Mystery Ship Pusher Plane Flights Al Williams and Foreign Pilots. Arrival of Cleveland Derby (Mixed Doubles Relay Race) Army Pursuit Planes. Parachute Jumping Contest Band Concert and Demonstration Flights Army, Navy and Marine Corps Night Flights Three Fireflys Fireworks Anti-Aircraft Barrage

Monday, September 1

Demonstration Flights Glider Contest Men's Dead Stick Landing Contest Balloon Bursting Contest Women's Dead Stick Landing Contest. Flag Raising Marine Corps Planes Pusher Plane Flights Event No 20—Men's Free for-All—650 cu in. Army Pursuit Planes Event No 12—Thompson Trophy Race for Men Civilian Acrobatic Exhibition Event No 32 A—Women's Free for-All Navy Planes Towed Glider (Capt Hawks) Al Williams and Foreign Pilots "Jimmy" Doolittle—Mystery Ship Event No 41—Sportsman Pilot Race—450 cu in Frank Hawks—Mystery Ship Parachute Jumping Contest Band Concert and Demonstration Flights Army Navy and Marine Corps Night Flights Three Fireflys Fireworks Anti-Aircraft Barrage

The Trend of Activities

BY R. SIDNEY BOWEN, JR.

THE one great shining highlight in the industry's activities during the past few weeks seems to be the mental chaos into which the airline operators have been pitched by the various interpretations of the Watres Bill Originally passed as a measure which would stabilize air transport in this country the Watres Bill is at present bewildering operators on all sides The most recent mystery touch was the ruling of Comptroller General McCarl on the matter of extending lines without competitive bidding Mr McCarl's ruling which is to the effect that extensions of air mail routes without competitive bidding must be extensions in fact and not major additions into new territory, and must be in the general direction of the existing route knocks the props out from under practically all of the extensions proposed by operators after months of negotiation and planning among themselves

On the surface it would appear that the best thing for operators to do is to sit tight until all of the interpretations of the bill have been squeezed out and there is no longer any possible chance for some governing body to upset the operator's applecart once he has got it rolling

Taking all in all the Watres Bill does help the big companies to some extent. And, in a way, that is perfectly alright, for the reason that in most cases the big transport organizations are far better equipped to operate new extensions However, there are some small lines that are not 'gyps' and are perfectly able to take on more airway mileage and operate it to the benefit of themselves and the traveling public Partiality to "big business" is justifiable at times and at others it decidedly is not.

As we see it the trouble with this latest effort on the part of the government to help aeronautics in this country is that no one seems to know definitely just how far individual authority goes A call for bids is issued but with it goes stipulations that seem entirely unauthorized, as far as the wording of the Watres bill is concerned and automatically eliminates some lines which are better equipped to operate than some of the lines that are entitled to bid

We sincerely believe that the thought behind the passing of the Watres bill was that American air transport would profit by it And we feel that eventually the whole matter will be straightened out satisfactorily But before that time comes to pass a whole lot of people are going to have headaches and a few lines that have set up a good record are going to be shoved down into oblivion That does not sound like good cricket but not every thing in progress is cricket Some one has to foot the bill and if a little of the good goes out with all of the bad we can do little else than mourn the loss and concentrate on making that which is left even better

Looking to the cheery sides of things for the moment we note that aeronautical estimates are now being made with a fair degree of conservatism For example, we stated last month that the Aeronautics Branch had estimated that 971 commercial planes had been built during the first six months of this year Since that time a final estimate has been made by the Branch and the figure is increased to 1 325 That is encouraging the production figure we mean! On the other hand it could be much more so, for even if production is the same for last six months of the year total production for 1930 will be just half of what it was for 1929

Another conservative estimate that was improved upon by a final checking is that the drop in aero exports for the first six months of the year was only 6.2 per cent instead of 11 per cent as estimated last month Incidentally, the decrease in exports was only in the case of planes Engine parts and accessory exports for the first six months were higher than for the same period last year

One hundred and eighty six planes valued at $2 838 484 were shipped outside the country during the first six months of this year as against 194 worth $3,247 074 in 1929 Power plants exported in 1930 numbered 183 and were valued at $832,784 as against 178 engines valued at $830 282 that were sent out during the 1929 period Those figures seem to indicate that our foreign customers are going in for small and cheaper engines

Exports of parts and accessories for the 1930 period were valued at $1 141 454 as against $1,053,525 in 1929, an increase of $87,929

And so we need not feel so bad about our merchandising progress True it could be better and will be better However, it is not so slow that we should consider packing up shop and casting about for a new industry

The above by no means suggests that we should permit our optimism to run wild We of the industry are past masters in that and now more than ever should we put a curb on expectations In 1927 we all went hay-wire and in recent months the glider's entrance into the spot light has presented indications that some may go hay wire again. The less we cast about for something to leap upon with all fours, and the more we stick to our knitting and be content with small developments, the better it will be for the industry tomorrow As Lincoln remarked ... We can't fool all of the people all of the time

And while we are on the subject of fooling people we note a growing tendancy to do that with respect to lighter-than air aircraft A short while ago the British airship R-100 crossed the North Atlantic from Cardington, England to Montreal, Canada, in 78 hr 52 min The flight was claimed to be a record crossing and thousands of words have been both spoken and written about airships as the coming thing for trans-Atlantic crossing. We do not deny that, but we do state that it will be a long time in coming, and is not just around the corner as lighter than-air enthusiasts are attempting to make the public believe

Before the man in the street will change his mode of travel he has got to be shown that the change is worthwhile Disregard the items of safety and cost altogether The airship will carry thirty or forty from Europe to America in around 79 hours The *Europa* or the *Bremen* will carry 2,500 across in about 108 hours True the airship saves us a day, but the saving is not anywhere near as much as it should be, considering the two modes of travel, to create any great amount of interest among the traveling public And when we take into consideration such factors as regularity of departure fare rate, safety, revenue possibilities passenger comfort, etc the airship is left far far behind

We repeat we believe that the day is coming when ocean travel by airship will be both possible and practical but that time is so far distant that to rave about it now is plain foolishness, and what is more, very misleading to the public The optimism bug bit us good in 1927 and unfortunately a lot of us are still itching However scratching the bite isn't going to help us at all In fact, its going to hurt us

THE air tour season is now in full swing and Kiwanis, Rotary, and Chamber of Commerce luncheon committees all over the country are having their hands full placing people at the speaker's table But to be serious air tours are good things and the more of them we have the better Of course there are air tours and air tours but the well managed ones are a real benefit to the industry Selling departments

are inclined to polish desk chairs instead of getting out into the field and doing some door to door canvassing. If more of them would get into some of these tours that are flying around, they'd get a much better idea of conditions in the field. Individual sales make up the bulk of gross sales. The sooner salesmen stop waiting for five and ten plane orders, the sooner they will see the blue ink on the sales ledger.

One tour that strikes our fancy just at present is the Great Lakes Air Cruise. Unfortunately only three water planes took off in that event, but it is to be hoped that if the cruise is held again next year that more manufacturers will enter planes. The water plane, particularly the amphibion, is becoming more and more popular among private owners. And as it is the private owner market that manufacturers are now bucking, the more water plane tours we have the better the chances of creating the interest of the prospect.

TWELVE hours and a half is all you have to allow for now if you wish to cross this country of ours. That is of course, provided you travel via Frank Hawks' Travel Air Mystery ship. The record that Frank established recently is all the more satisfying when we consider the fact that it is just about as low as we can get it for quite awhile. From now on we can look for definite movements toward the establishment of a fast coast to coast service and less record breaking flights made while "pioneering" the route.

Of all the recent coast to coast trips made, Hawks' are perhaps the most significant. A non-stop, service to the coast is too undependable for development right now. And although a one or two stop route can be operated with a considerable degree of regularity the three and five stop route that Hawks worked out should prove the best. To begin with, such a route would cause less wear and tear on the individual pilot. Each pilot would have only a few hundred miles to fly, instead of a long jump at top speed. It would also save wear and tear on the planes. That is, of course, if more than one plane were used. And it would seem altogether fitting to use more than one. Why fly the wings off your equipment?

The third favorable factor would be that a greater area would be served. In short, work out the line just as the mail lines are worked out. That is, if there was no interpretation of the Watres Bill to upset calculations and expectations.

A REPORT on transport activities in this country recently issued by the Aero Chamber of Commerce presents a very pleasing picture. The report, which is for the first quarter of the year states that American transport planes flew more than 4,000,000 miles in scheduled operations during that period. The exact number of miles flown by the 34 transport companies supplying statistics was 4,449,791. This figure includes only regular passenger, mail and express operations and represents 85 per cent of the total miles scheduled for the quarter. Mechanical failures were responsible for only 079 per cent of the scheduled milage not completed. That is indeed very interesting if for no other reason than the fact that it is food for thought regarding the question of whether single engined or multi engined planes are best for transport work. A total of 74.65 per cent of the planes reported in regular use were powered with one engine, 85 per cent of them were fitted with two engines and 24.5 per cent had three engines. The report did not state how the mechanical failures were divided up among one, two and three engined planes. Therefore, one guess is as good as another.

As mechanical failures sometimes result in accidents it is interesting to note that a new system of airplane accident reporting has been inaugurated by the Aeronautics Branch. The idea is to obtain increased and more uniform statistics upon which to base the Branch's semi-annual reports. It is also expected that as a result of the system that insurance companies will be able to draw up actuarial tables upon which rates may be based at a much lower premium. If that be true plane owners can offer up prayers of thanks, and so can prospective plane owners, for it has been the matter of insurance that has been a thorn in the side for a long time.

However, all the accident statistics in the world will not have one hundredth the effect upon insurance rates that a reduction in accidents will have. While we can feel very glad that the rates are scheduled to go down, probably, we do not want to lose sight of the fact that they will not stay down if we increase the number and frequency of our unintentional contacts with Mother Earth. What we need is a system that will curb that sort of thing. Unfortunately though such a system must be devised in the individual brain, and the best way to go about that is to clear the old brain of ideas about beating the weather, giving the girl friend a new kind of thrill, yanking the bus off the floor, etc.

A short time ago a Senator by the name of Bratton sent chills up and down the aeronautic spine by introducing a bill (which has already passed the House and is in unfinished Senate business) designed to give the Interstate Commerce Commission regulatory powers over interstate air commerce now exercised by the Aeronautics Branch. Recently the Commission reported its opinion of the Bill to the Senate Interstate Commerce Committee. The report is both interesting and gratifying. It looks as though the Aeronautics Branch will be able to continue its good work without interference. The Commission states that it lacks adequate knowledge on air transportation and is therefore unable to state whether it should exercise supervision of air transportation from the standpoint of rates, capitalization and organization. However, there may be a need of regulation from the standpoint of public safety.

The Commission also reported that should Congress invest regulatory powers in the Commission that it would favor amending the Interstate Commerce Act rather than setting up a separate act such as is the Bratton Act.

The one part of the report that brings forth our applause is the recommendation that the investigation of air accidents be left with the Aeronautics Branch. Incidentally the Bratton Bill was more or less prompted by Congressional dissatisfaction and curiosity over the unavailability of detailed reports of individual air accidents as handled by the Aeronautics Branch. Score one for the Branch!

THE next few weeks should bring forth many interesting things. There is always something new at the Air Races, if only squabbles among the contestants. The summer selling season will be history, and plans for 1930 will be announced. The Watres Bill will be ripped apart some more, and who knows ... perhaps an order or two for a private plane will be received by some manufacturer!

Shop Notes and Technical Data

THE DEVELOPMENT OF THE AIRPLANE CHAIR

By John L. Hardecker
Naval Aircraft Factory
Philadelphia, Pa.

MORE and more, the specialty manufacturer is becoming the predominating influence in aircraft fabrication. This is but perfectly natural and proper, for in most instances, the airplane manufacturer individually cannot devote to each component unit of his plane that same infinite design, test, research and tooling-up which is the natural interest of the manufacturer who concentrates on but a few items or who works only in a particular field. Here and there, due to the magnitude of an airplane manufacturer, or to some peculiar interest, this may be done, but in general separate units are becoming the product of specialized activity.

It may well seem at first glance that the matter of airplane chairs is a comparatively simple one — lightweight, reasonable sturdiness and pleasing appearance would seem the only prerequisites. That the aircraft engineer, confronted with his many problems of safety and efficiency in design, felt likewise was well attested to by the earlier passenger chair installations. In fact the passenger chairs in the earlier cabin planes appeared as though they were a distinct afterthought—something to be shopped for locally and hurriedly purchased from available stock.

The aircraft industry is providing a means of speedy transportation, but the element of personal comfort has an important bearing in the selection of equipment by the travelling public. The seat equipment affects the comfort-consciousness of passengers more than any other single detail. The building of seats for any purpose is one that requires considerable study of the human anatomy so that the proper comfort factors may be built into the seat. A chair that may be very comfortable when tried out in an office for only two or three minutes may prove to be an instrument of torture when one is obliged to sit in it for any great length of time.

With the growing development in the use of metals for plane fabrication it has likewise become apparent that metal possesses the most desirable characteristics for chair fabrication. The selection of the light alloys as the proper material for chair construction is founded on reasoning too obvious to warrant detailed development here. The ever familiar strong aluminum alloys are used to advantage, and most recently, the use of magnesium alloy has been introduced.

The reclining chair illustrated is fabricated from strong aluminum alloys by the Aluminum Company of America. Rivetting and welding are used as fabrication processes. The detail sizes and weights of this chair are as follows:

Thickness leg stock	13 gage or 0.040 in.
Thickness flange tubing	19 gage or 0.036 in.
Clearance depth of seat	15 in.
Over all depth of seat	26½ in.
Clearance width of seat	17½ in.
Over-all width of seat	20½ in.
Weight of chairs less upholstery	6 lb.
Weight of upholstery average	6½ lb.
Total weight of chairs, average	12½ lb.

Strength tests have been designed by the manufacturer to test both the fabric and the chair structure. One test was designed to load the seat frame and fabric as a separate unit, apart from the chair structure proper. In order to approximate actual use as nearly as

possible in this test, a sand bag was made which had a diameter of 12 in. This was filled with approximately 100 lb. of sand and inserted in a piece of 12 in. galvanized iron tubing. The bottom of the bag extended about 2 inches out of the tubing and rested on the fabric seat.

The platform was then loaded until the total weight was 500 lb. This caused a slight sagging of the webbing, but no failure occured. The same seat was then loaded to 1,754 lb. before the webbing tore and the test was stopped. At this point, the load was still supported in spite of the failure of the two center webs. At a load of 1,160 lb. the front corner gussets bent slightly out of line.

A further test was made on the complete chair structure which had been through the entire fabrication schedule, baking included, by the Ford Motor Company. With the seat cushion in place the assembled chair was loaded to 1,000 lb. by means of the sand bag and platform. This developed no points of weakness. It was thought desirable, however, to determine the weak member of the chair even if it were above the point of failure of the webbing. To do this the weights, sandbags and seat cushion were removed and a wooden platform laid across the seat frame. In this way the loading was applied to the chair structure through the seat frame but without any dependence being placed upon the seat webbing. In this test, no sign of failure was indicated until the total load was 2,657 lb. At that point the gusset section of the front legs began to bow inwards. This load was still supported, however, in spite of the buckling, but no further load was applied.

The deck chair type of design for aluminum alloy airplane chairs is the development of the J. A. Brill Co. Both the adjustable and stationary chairs developed are constructed principally of heat treated, three quarter inch alu-

Left: Reclining chair with adjustable back. Made by the J. G. Brill Co.

Below: Double type chair made by the Aluminum Co. of America. A single chair of the same type is also manufactured by this company.

minum alloy tubing. To this framework is attached a one-piece leather cushion support and back The cushion and headrest are padded and upholstered in leather The stationary type, having no operating mechanism is the lighter of the two Detail weights are

Stationary Type

Weight, Metal Work	6 lb 15 oz
Weight, Upholstery	7 lb 1 oz
Weight, Complete	13 lb

Adjustable Type

Weight Metal Work	8 lb 4 oz
Weight, Upholstery	11 lb
Weight, Complete	19 lb 4 oz

In the adjustable type, there is a push button directly under the arm on each side, the pressing of both buttons at the same time releasing the back As the passenger pushes backward the back moves to the first of three reclining positions The same operation is necessary to move to the second and then the third positions As the passenger returns to an upright position the chair automatically follows

A straight chair is fabricated from magnesium alloy by the Dow Chemical Co The frame without cushion weighs approximately 2½ lb Similar chairs are built by the Kelton Aurand Co The use of a special light braided fibre as a filling material brings the total weight with back and seat pads to approximately six pounds

The new development in the use of "Dowmetal" (magnesium alloy) is based on the new technique of welding magnesium alloy, the process used throughout in fabricating the Dow chair This metal, which is only 65 per cent as heavy as duralumin, is readily joined by acetylene welding, as well as by electric spot and seam welds By using a suitable flux, no inert atmosphere or other special technique is required for acetylene welding

Passenger chair design and fabrication must keep pace with aeronautical development — it is too important a factor in selling air transportation to be relegated to an afterthought Specialty manufacture is solving its peculiar problem, and offering fabricated products in the most logical materials—the light alloys Even for the custom designed and furnished cabin plane for the private owner, light alloy furniture is available in modern styling The airplane manufacturer who neglects to look into this relatively small but highly significant matter, is taking an unnecessary chance with his sales prospects

NEW MOTOR DRIVEN HANGAR DOORS

By Geo. G. Landis

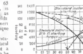
Electrical Engineer,
The Lincoln Electric Co., Cleveland, O

THERE is probably no feature of aeroplane hangar construction more interesting than the operation of the canopy type doors which have been installed in the new hangar at the Cleveland Airport at Cleveland Ohio

The new hangar has a floor space of 200 by 120 ft It was built by The Austin Company of Cleveland who installed their "Clear Open" canopy doors The building is of cantilever type construction and has a single supporting column in the middle of the building The ceiling clearance under the doors and inside the building is 20 ft

The canopy type doors, which are the feature of this hangar, extend the entire length of the building on one side, as shown in the accompanying picture They are divided into 8 sections, each 25 ft long and can be operated either as an entire unit, or each section separately There are no guides for the operation of the doors either in the form of posts or rails they being operated by two large lead screws one at each end, which are rotated through beveled gears by means of a special 5 hp "Lane Weld" motor The doors can be started stopped or reversed from any point between the completely open and closed position There is also an automatic stop provided This stop comes into operation when the doors have reached either the completely open or completely closed position When closed the doors form a solid wall except for two small pass doors one in each end section These small doors obviate the necessity of a passage way for persons entering or leaving the hangar when the canopy doors are closed

The design of these doors also governed the design of the motors to be used It was evident that since this motor must be able to start the doors moving in either an up or down travel,



Characteristics of standard and special door motor compared

at any position of the doors, that this was not a standard motor application The motor finally adopted is one which is high in torque and low in current at start

This low starting current was considered exceptionally important because using ordinary motors when opening four or more sections at a time, under severe conditions, the drag on the power line might be great enough to drop the voltage to a point where one or more of the doors would fail to open By keeping the starting current at a minimum the possibility of excessive drag on the power line was overcome

Three curves plotted by the airport engineers show further characteristics of these motors The curves which were plotted during experimental work at the plant of the Austin Co showed deviation from the actual installation curves only as regarded wind pressure on the doors

The tests on the experimental doors at Cleveland were made in still

Canopy type of doors installed at Cleveland

air while those at the airport were made with an estimated breeze of 2 to 10 m p h blowing against the door Curves plotted under these conditions show a starting current of 58 amp which decreases very rapidly to a value of about 20 amp then gradually rises again as the door is opened reaching a final value of 32 amp about the time the motor is automatically disconnected from the line This current varies with the wind pressure against the door In case of a heavy gale against the door the current would be maintained at a value of about 35 amp throughout the time required to open the door completely The time required to open the doors is plotted as 60 sec, although the doors open wide enough to admit a plane in a period of 50 sec

The accompanying chart shows a comparison of the torque characteristics of a standard motor and the special high torque motor installed at the Cleveland airport for the operation of these canopy type doors The broken line represents a standard motor and the solid line represents the high torque motor A comparison of the two curves plotted in this figure show that a standard motor would develop sufficient power to open the doors, but because of the low torque at start, it would not be able to start the door moving upward from various intermediate points The same would be true, if, while opening the doors, they would be suddenly [illegible] strong gale, before developing maximum torque The special motors, with which the doors are now equipped develop maximum torque at start, however and are thus able to start the doors moving from any position A sudden gale would likewise have no effect on the movement of the doors other than a slight decrease in the speed of the motors

Under ordinary circumstances high torque motors, such as these would present a problem of overcoming excessive heating however, due to the intermittency of operation of these doors the heating factor is negligible In the tests made at the Cleveland airport, although the doors were opened and closed as rapidly as possible there was no appreciable heating of the motors

In tests made at Cleveland after the installation of the doors all manner of extremes were tried as well as intermediate conditions From one to eight doors were opened and closed at the same time and started and stopped at various intermediate points The actual performance checked very closely with the preliminary setup

These doors and their modern method of operation were adopted for the new hangar at Cleveland after extensive experimentations They are especially adaptable to hangar construction because of the speed and ease of operation and the extensive clearance they permit

New Equipment

NEW KINNER 125 HP. ENGINE

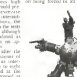
PRODUCTION is now under way and deliveries are being made on the new Kinner B 5 125 hp five cylinder radial aircraft engine which has been granted A T C No 51 with a rated hp of 125 at 1925 r p m The new engine very closely resembles the popular K 5 100 hp model in general appearance, but represents new design from an engineering standpoint It has been thoroughly proved by more than 18 months of flight testing before being placed in production The new engine has a piston displacement of 441 cu in., an overall diameter of 45¾ in and a weight of 295 lb, dry without starter, exhaust collector ring or propeller hub The new engine will fit the same mounting ring as the K 5 model, and for those planes which are approved for 125 hp it can be installed without marked change in the plane

The cylinder barrels on the B 5 engine are machined from forged steel blanks, with an aluminum alloy cylinder head held in place by sixteen stud bolts. Two valves intake and exhaust are carried in each cylinder head with valve seats of special bronze shrunk and rolled into the head. The valves operated in conventional fashion by push rods and rocker arms fastened to the head are completely enclosed Each cylinder is fastened to the aluminum alloy crankcase by eight stud bolts which are easily accessible

Aluminum alloy pistons have three compression rings and one oil ring all above the piston pin which is hollow and of full floating type, with aluminum buttons pressed in at the ends for end wise location The crankshaft is of single piece construction machined from forged alloy steel heat treated and ground and is carried on plain babbitt bearings with ball bearings for thrust loading Connecting rods are machined from H-section forged alloy steel, the master rod being built in two sections for demountability while articulating rods are mounted in the conventional fashion with knuckle pins

As in the K 5 model the valve mechanism is actuated by five independent cam shafts each having a separate inlet and exhaust cam, and each driven at one half engine speed by a main pinion fastened to the crankshaft The cam followers are of roller type. Tappets run in aluminum alloy guides and push rods are equipped with hardened steel ball ends The valve to tappet clearance adjustment is cared for in the rocker arms

High pressure lubrication is employed, oil being forced to all gears and bear



The Kinner B 5

ings through the hollow crankshaft to appropriate passages and returned to the oil tank by an independent scavenging pump Pressure is maintained at 80-90 lb through the action of a by-pass valve

Accessories include two Scintilla magnetos, two tachometer drives starter mounting, Stromberg or Holley carburetor, carburetor heater and air cooler Bayonet exhaust stacks are standard equipment, and an exhaust ring can be furnished at purchaser's option Cylinders are finished in black enamel, crankcase in battleship gray and all steel parts are coated to prevent corrosion

Specifications are as follows

Rate hp	125 at 1925 r p m
Number of cylinders	Five
Bore	4⅝ in
Stroke	5¼ in
Displacement	441 cu in
Compression ratio	5.25 to 1
Ignition	2 Scintilla
Carburetion	Stromberg or Holley
Crankshaft pro end	S A E Standard No 1
Engine weight dry	295 lb
Overall diameter	45¾ in
Mounting bolt circle diameter	14 in
Overall length	32¼ in

THE SPARTAN C4-225 CABIN PLANE

SINCE its announcement early in the spring, the Spartan cabin plane has attracted much attention Powered with a seven cylinder Wright "Whirlwind," the plane seats four people and carries, in addition, 100 lb of baggage It has a wing span of 50 ft a length of 31 ft. 6 in and a height of 9 ft

Construction on the plane is conventional The wings use a Clark Y section and spruce "I" beam spars Spruce

ribs fabric covered complete the construction of the wings which have an area of 299 sq ft, including ailerons

The fuselage is built up of welded chrome molybdenum steel tubing and the framework is covered with fabric The engine cowling is made of metal

The engine delivers 225 hp at 2 000 r p m The plane has a fuel capacity of 85 gal and an oil capacity of 6 gal The power loading is given as 15 6 lb per hp while the wing loading is 11 7 lb per sq ft The plane has a gross weight of 3 515 lb Specifications are as follows

Weight empty	2 325 lb
Useful load	1 190 lb
Gross weight	3 515 lb
High speed	129 5 m p h
Cruising speed	109 m p h
Service ceiling	14 200 ft
Range	815 miles
A T C No	310

stabilizer sweeps back to the elevators. A tail wheel is provided for handling on the ground

The undercarriage is supported by oil and spring shock struts with air wheels and brakes as standard equipment The cowling is divided into four sections for easy accessibility to the engine

Dual control attachments are under neath the floor board leaving the cockpit free for such baggage as may be desired. A V type front panel is equipped with two compartments for the stowing away of helmet goggles and other small parcels For instruction purposes the dual controls are easily installed

An unusual feature of the brake control is that the brakes are independently controlled and operate in conjunction with the rudder off the same foot pedals An auxiliary hand control enables both brakes to be locked simultaneously, and brake controls are installed in both cockpits Provisions are made for preventing the operation of the brake controls in either cockpit which allows the instructor to have the use of the brakes for emergency purposes

Specifications are as follows

Length	20 ft. 8 in
Height	8 ft. 4 in.
Span	29 ft. 6 in
Chord	57 in.
Wing Area	240 sq ft.
Weight empty (Kinner	1 095 lb.
Weight empty (Warner)	1,110 lb
Gross Weight	1 880 lb.
Oil Capacity (Kinner)	5 Gal.
Oil Capacity (Warner)	4 Gal.

MODEL "F", THE LATEST WACO

APPROVED Type Certificate No 311 has been granted the Waco Aircraft Company on its Model "F" powered by a Warner Scarab" engine The same plane powered with the Kinner 100 hp engine has been given Approved Type Certificate No 313

The new Waco is a 3-place open cockpit biplane In size it is slightly smaller than other Waco models the wing area being 240 sq ft The lines of the new models which present many improvements over previous Wacos are very pleasing to the eye and the long streamlined headrest which is part of the turtle deck, lends a racy appearance First and foremost of the innovations is the modified Heinkel truss of the wings which simplifies the number of exposed wires and adds to the clean cut lines

Greater visibility upward and down is obtained by the 50 per cent stagger of the wings the cut out center section increasing the visibility overhead A new and improved aileron control has been designed and skewed ailerons attached to a false spar in the wings produce a taper wing effect Molded Pyralin windshields are among the features

The curve of the rudder is carried out in the vertical fin which is streamlined into the fuselage and the horizontal

The Salesman's Notebook

DON'T SELL 'EM AND LEAVE 'EM

By E. B Smith

Salesmanager Aero Corporation of Calif

A RATHER outstanding example of this sales policy occurred a couple of years ago We were then confining most of our efforts to moving Eagle rocks A young man in the central part of the state was struggling along with an old slow job hard to get off the ground during the hot summer days The new plane I was flying looked mighty good to him and he wanted to make a deal with me immediately, turning in his crate as part of the purchase price

Having been told that my prospect knew everybody in that territory their relatives their worth their characters, or what have you I came to the conclusion that a little push and a little steering on my part would make this deal something more than just a sale

We sat down in the corner of the hangar together and I outlined his assets and what he could do with them And to stiffen his backbone a bit I promised to "stay with him" until he had accomplished the things I visualized for him

Between us we gathered in a couple of fliers who were short on cash but long on ambition We sold them his old crate I handed over his new job to him and took the train back to Los Angeles where upon my arrival I found a wire awaiting me He had gotten the "selling" idea and wanted to know the price on a new Hisso Eaglerock

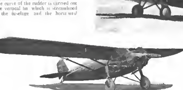
Not only did I send him that but along with it we named him as our dealer in that territory Whereupon he landed a local automobile man as a partner Sales experience plus air experience—a fine combination

Every so often I flew up to their airport taking with me all of the new sales ideas we and our other dealers had found to be successful I was rewarded with occasional orders which gradually mounted to a respectable volume

To bring this yarn up to date—this man and his partner established themselves at a nearby new and thriving airport and at the end of last year were ordering planes from the factory in car load lots. During December, January and February last, they sold more of one type of plane in their territory than all of the planes combined moved by their competitors

Believe it or not—to sell 'em and leave 'em, if they need your ideas does *not* build sales volume The benefit of your viewpoint and experience if he will accept it is often the stimulus that a "one plane" customer needs to turn him into a consistent repeater

Above The improved Waco model "F" powered with the Kinner engine.



Left The Spartan cabin plane, the C-4-225 It is powered by a Wright Whirlwind 225 hp engine.

CUSTOMERS AND THE MIMEOGRAPH

By Walter A. Hawkins and Ed. L. Erickson

Partners, Aero Brokerage Service Co

WHEN we opened our used plane brokerage service at the Los Angeles Metropolitan Airport our immediate problem was to acquaint likely prospects with the very good buys which we had to offer We decided to publish a regular bulletin every two weeks, listing all the planes and engines which we had for sale and sending it to everyone whom we knew to be interested We bought a mimeograph machine for $200 an addressograph for $100 learned to use them ourselves, and since February of this year we have published our bulletins regularly By carefully noting the name of everyone we meet, or hear of in connection with airplane selling we have been able to build up a list of more than 1 000 names of persons who are likely prospects for the sale of used airplanes

On one occasion we prepared our bulletin listing all of our latest bargains, and briefly outlining the history and condition of the planes which we offered for sale and placed our thousand bulletin filled envelopes in the Hollywood post office at 6 00 p m Before 9 00 a.m. the next morning a gentleman was on the field with one of our bulletins in his hand asking to be shown one of the planes which we had listed. The sale was made that day at a profit of $300 exactly the amount that our mimeograph and addressograph outfit had cost us. Thus one sale directly traceable to the work of our little mimeographed bulletin has paid off the entire cost of this equipment

We are thoroughly sold on the well directed mail campaign method of selling airplanes and intend to work our little mimeograph machine overtime in the future.

KNOW YOUR INSURANCE DATA

By C H Biddlecombe

IN SELLING an airplane to an individual or business house, one of the important questions usually arising is that of life insurance Salesmen are very often vaguely informed as to the effect of air travel on the normal life insurance policy, and the extra premiums charged to cover the hazards of flight Every airplane salesman should study this problem and be in a position to advise his customers

Generally speaking, a life insurance policy is incontestable after being in force one year, although a few insurance companies issue policies which are incontestable only after two years from the date of issue This in effect means that the majority of policies dated prior to 1928 are not invalidated by reason of the insured party being involved in an airplane accident

In the case of more recent policies or those which exclude aviation it is necessary for the insured to obtain protection if desired, by the payment of an extra premium. These premiums vary in amount, and the risks accepted by different insurance companies are also subject to individual rulings

Most life insurance companies, however, are prepared to classify the hazards of flight under one of the six following heads:

1 Fare paying passengers who occasionally use airplanes on business flying only with licensed pilots on established air lines

2 Applicants employed by corporations owning and operating an airplane flown by a licensed pilot employed by the corporation and used for transporting the executives of the corporation

3 Applicants owning an airplane flown by a licensed pilot for business and pleasure from properly equipped airports

4 Applicants owning and operating a plane chiefly for pleasure or sporting purposes

5 Applicants who do not own or operate a plane but occasionally fly with friends for pleasure

6 Civil, military and naval pilots aerial photographers etc

The sale of an airplane to the individual or business corporation will normally involve consideration of classes 2 to 5 inclusive and some 20 of the leading life insurance companies are prepared to quote premiums for these risks The premiums are in general based on the number of flights made annually ranging from no extra premium in the ease of an applicant making less than five flights up to $25 per $1,000 for more than forty flights per year in the class 2 group Premiums are usually slightly higher in classes 3, 4 and 5 above than in class 2

Contributions to this department are solicited, and as an inducement to aeronautical merchandising men AVIATION will pay the sum of $20 for the best article, $10 for the second best, and $5 for every other article printed. Merchandising value, originality and brevity will constitute the judging yardstick. Contributions must be in this office by the fifth of the month for insertion in the following month's issue.

SELLING AIRPLANES BY RADIO

By Maynard Dowell

Salesmanager, Pacific Aircraft Brokers

WHEN we started in the used plane business in January we first obtained listings of more than 150 used planes by sending a listing card to every used plane owner on the Pacific Coast with the request that those persons who wished to sell their equipment fill out the card and return it to us With an ample number of planes for sale we were confronted with the task of locating buyers in considerable quantities By newspaper and aviation magazine classified section advertising we were able to broaden the field of our personal contacts and make a fair number of sales. We were still missing many that I felt we should reach

At about that time a friend of mine

who was selling advertising time on the local radio stations showed me how cheaply radio advertising could be purchased and I determined to try it Our company contracted for two months' of radio advertising over four local stations six nights a week We were announced as the sponsor of a 15 minute program each evening, and during each program a 100 word announcement was read which featured one or two of our best bargains The entire cost of the 60-day radio campaign amounted to $600 and our business, partly due to the influence of the radio advertising, developed a gross volume of more than $50 000 for the first six months of the year We had a plane on hand for two months and were unable to sell it in spite of consistent newspaper and magazine advertising and personal effort We announced it over the radio at 3 00 p.m. one afternoon and had made the sale for cash by 10 00 a.m. the following morning We have been able to trace three sales directly to our radio programs, and the total commissions from those three sales has been $1 020, or $420 more than the cost of our radio advertising campaign.

What Our Readers Say

The Tri-Engined Airplane

To the Editor

After the recent accident at the Boston Airport when one engine of a three engined transport plane stopped on the take-off and the airplane landed straight ahead in the harbor like any single engine airplane would with a dead engine no one raised the point in the newspapers at least, that three engined airplanes were supposed to be able to fly on two engines and by "fly" is meant to have enough performance to get out of the usual field In fact according to the same newspaper accounts the pilot and co-pilot were congratulating each other because they happened to be taking off toward the harbor rather than the densely populated area of East Boston It would seem from the pilots' reaction that they do not expect the machines to do much when one wing engine is dead

It is not sufficient that a three engine plane be able to fly level or even climb slightly with one motor throttled after a safe altitude has been reached Anybody can do that The trick is to keep climbing out of a field after one of the motors has unexpectedly stopped and the 'unexpectedly' part of it has a great deal to do with the difficulty of taking care of the situation In the case of the single engine airplane the airplane at least goes straight ahead after the engine has stopped In the case of the multi engined ship you not only lose power but also must be able to take care of the eccentricity of thrust

In the usual test of a three motored airplane, the pilot climbs to a safe altitude throttles one engine and then demonstrates the ability of the plane to fly level or even climb slightly Under these conditions control is not very difficult In the case of engine failure during take-off a pilot is not interested in maintaining an altitude of a few feet or even climbing at the speed of best "rate" of climb as he faces the immediate problem of getting over an obstruction so he automatically pulls the nose up to the speed of best angle of climb Then since the propeller thrust increases at full throttle, as the airspeed decreases and since the rudder is not usually placed in the slipstream, the rudder control decreases as the square of the airspeed and the turning moment due to the thrust increases more rapidly than the control moment due to the rudder as the airspeed decreases There is then an airspeed below which the pilot cannot control the airplane, so even if the angle of climb with one motor dead is sufficient to clear the obstruction the pilot is unable to clear the obstruction on account of his inability to hold the airplane straight at the speed of best angle of climb

If the cases when one engine of a three engined airplane stopped on take off are analyzed it is found that in every case when the airplane was fully loaded if the pilot was unable to land straight ahead a serious accident occurred This makes the three engine airplane at least twice as dangerous as the single engine craft during the most hazardous part of a flight

Sooner or later it will be necessary for the Department of Commerce to require that a three engine airplane be able to take off with a full load with any one engine dead with the same minimum performance required of a single engine airplane at present The allowable gross load should be limited on this basis for the present day ships rather than on the basis of structural strength

Otto C Koppen
Associate Professor of Airplane Design
Massachusetts Institute of Technology

[The point made by Professor Koppen is a very interesting one too often overlooked The mere ability to maintain altitude at cruising speed with one engine stopped is of course a substantial safeguard in some conditions as when flying over open water or mountains As Professor Koppen reminds us, taken in itself it may be no safeguard at all during the take-off The suggestion made in his last paragraph, while it seems very severe for general application, is certainly one to which the Department of Commerce and the air transport operators must give very sober consideration —Ed.]

Would Teach Himself to Fly

To the Editor

I have had no flying experience nor have I so much as been in a plane, but if you will make available a late model of one of the leading makes I will fly it alone, after not more than an hour of ground work

I think I speak for the average young person when I say that aviation seems hopelessly far away Expensive planes and expensive flying schools make it so yet both are doomed sooner or later, and it is with the hope to make it sooner that I propose this thing I think that most people can teach themselves to fly, and I would like this opportunity to try the theory out—no, I'll be honest about it I want to do it for the sport of the thing and for the chance to fly

[The above letter came to us with the author's signature, but his name is being withheld for obvious reasons Although the suggestion that he makes in the first paragraph may be over-ambitious his closing sentences express the reaction of a great many young men and their heart-felt desire to be convinced that it really is easy to fly—Ed]

An American Light Plane Tour

To the Editor

As briefly as possible, I wish to express my appreciation of the sound thinking embodied in your editorials

I wish to comment especially on the one advocating a special "tour" for light planes What would be wrong with conducting an elimination tour in America and then sending the winners of first and second place to Europe to compete?

I believe a separate tour for light planes would result in more rapid development of this highly important class of planes

Your recent editorial on "Advertising Safety" is so obviously sound as to need no comment

The article by Mr Burtt in the current issue is both timely and refreshingly frank. As one who has been employed both as a salesman and a sales manager for the past eight years I would say that I believe Mr Burtt's statements are quite accurate

Current airplane salesmanship is too unscientific

W F Kaltenbach
Lansing Michigan

[Mr Kaltenbach's suggestion that small sport planes might be selected in America through a preliminary competition and sent to Europe as the representatives of the American industry and as advertisements of American design and construction (and presumably at the collective expense) appeals to us strongly We hope that more will be heard of it before the plans for next year's international tour are complete —Ed]

Inexpensive Small Planes

To the Editor

In view of the development of such small planes as the Aronca and power gliders now being built by several companies and their possible significance in rapidly increasing the number of private plane owners, would not an article describing the various planes in this class be of special interest to your readers? It seems to me that the ownership of a thousand dollar flying machine is much more important to the aviation industry than the expenditure of a thousand dollars for air transportation over scheduled lines

Martin Dodge
Vice President,
Aviation Securities Corp
of New England

[Mr Dodge's suggestion is one which we hope shortly to adopt In the meantime, we offer the expression of opinion in the last sentence of his letter as one upon which there may be much difference among our readers—Ed.]

Airport Patronage

To the Editor

Appreciating your position in the world of aeronautics we are taking the liberty of approaching you in the hope that you may be able to offer some valuable suggestions whereby the Municipal Authorities of this city may reach the goal they desire to attain

We have a Municipal Airport in this community ready for operation Under action of Council taken sometime ago, the City Service Director, Mr A D Rowlands, was authorized to enter into a lease with private corporation or operators, whereby commercial activities would be commenced upon this field Legal notices, together with news stories and paid advertisements in several of our central newspapers, have not produced to date, any evidence of interest in this lease

We are wondering if you are in a position to make suggestions or advise us where reliable operators might be found that would have an interest in coming into this city and taking over the complete operation of this port We will be greatly appreciative of any advice or suggestions you may care to make on this subject.

Thanking you in anticipation of your valued reply we are,

Chamber of Commerce
Mansfield, Ohio
A D Gaddell,
Secretary

[The problem raised in Mr Gaddell's letter is one of general interest Airports will not continue available unless some use is made of them, or unless some interest is shown by the aircraft industry in using them as bases of operation Such disappointment as that which Mr Gaddell's community has suffered should be a matter of immediate concern to the aeronautical interests of the region and especially to near-by air transport lines and to experienced operators based at near-by ports Even though they cannot participate actively on their own account they should make it their business to watch the development of new fields and to be generous with advice and the best means of operating them or attracting patronage —Ed]

Abstracts and Reviews

M.I.T. EXPERIMENTAL FOG STUDIES

Synoptic Studies in Fog *By H C Willett Ph D, Meteorological Papers Vol. I 1 Massachusetts Institute of Technology*

DURING the past few years a fairly complete and detailed record of weather observations has been kept at Hadley Field This study was undertaken with the object of determining to what extent a careful examination of such local records would assist in explaining and forecasting local fogs

The period covered in this study was from September 15, 1926 to January 1, 1929 The records included observations of visibility ceiling condensation forms, and humidity as well as temperature state of weather barograph trace wind direction and velocity pilot balloon observations and time of beginning and ending of all precipitation fog and haze

During the earlier part of the period the observations were made at somewhat irregular intervals with only two humidity determinations per day but in 1928 an all-night weather service was instituted at Hadley and relative humidity readings were made at six hour intervals while the other observations were taken at the end of each hour throughout the twenty-four

One hundred and ninety-three cases of fog formation were observed at Hadley Airport during the twenty-seven and one-half months covered by this study, this number including only the situations in which fog was observed at the ground of such density that the horizontal visibility was reduced to 4 or less on the Weather Bureau scale that is prominent objects or landmarks were invisible at a distance of 2 kilometers or $1\frac{1}{4}$ miles If the fog did not extend to the ground it was not considered, although many cases of low ceiling are actually high fogs which for one reason or another cannot settle quite to the ground

Any fog which formed with skies not more than partly overcast during the cooler part of the day in the absence of any appreciable solar heating was classified as a Radiation Fog Of the 193 cases of fog occurring during the period studied, 116 were of the Radiation type Of this number, all with the exception of possibly two or three were of the Ground Fog type, that is, they appeared first at the ground, and as they deepened and thickened they remained densest at the ground (This use of the term is to be distinguished from that commonly given in ordinary aviation meteorology parlance where Ground Fog means simply a fog of comparatively slight vertical extent.) In contrast, only one or two instances of High Inversion Fog were observed a High Fog being one that grows down to the ground from an upper inversion, and having its greatest density at the upper inversion The almost complete absence of such fog was explained by the fact that its formation requires a long persistent stagnant anticyclonic condition with sinking of the cold air mass and marked subsidence inversion formation Such conditions are not common to the Eastern United States and when they do occur the source of the cold air is the Canadian Northwest, rather than some maritime source so that sufficient humidity is lacking for a dense fog formation

The most striking fact concerning Radiation Fogs was the extremely variable nature of the prevailing conditions which led to the formation of the fog The decisive factors in Radiation Fog formation are (1) radiational cooling of the air above the ground (2) relative humidity of this air, and (3) the air movement or wind These quantities are entirely too variable to permit any satisfactory forecasting of the occurrence of the type If however, observations of the three quantities were taken regularly at a given length of time after sunset, instead of at a fixed hour a considerably more precise formulation of the conditions normally resulting in the formation of Radiation Fog could be effected

Although the formation of surfaces of subsidence over the Eastern United States rarely leads to the formation of the fog, it invariably leads to the appearance of layers of dry smoke haze at

the inversion, and these may become sufficiently dense as to be a menace to flying. At Hadley this High Inversion type was the only kind of haze to attain significant proportions. It is characteristic only of the winter season when radiational cooling from below permits of the continued existence and growth of marked upper inversions.

Monsoon Fogs were second only to Radiation Fogs in the frequency with which they occurred at Hadley Field. Due to the effect of the Labrador Current, Monsoon Fogs are almost constantly present just off the coast during the spring and summer. Weak disturbances passing off the coast bring the fog inland. A current of warm air from the southwest passes off the coast to the south of New Jersey, the cold waters cool the air, and fog forms which is brought around on shore as a current of cool foggy air from the east. Such fogs occurred during the entire year though they were observed to be most frequent during the spring and summer. Not only were Monsoon Fogs frequent in appearance, but also they were especially troublesome because they often lasted for two or three days.

Third in importance from the viewpoint of frequency were the Prefrontal Fogs, of which there were 31 at Hadley Field during the period studied. Of these the majority occurred before a warm front. Prefrontal Fogs are formed as a result of: (1) the saturation of the cold air mass in advance of the warm front or occluded front by the falling frontal precipitation, and (2) the adiabatic cooling of this mass as a result of the prefrontal pressure decrease. Since both of these factors are most effective before the warm front of a vigorous cyclonic development, the Prefrontal Fogs are most marked before warm fronts, and during the season of greatest cyclonic activity. This explains the predominance of the warm front type at Hadley, and furthermore, the greater frequency of these fogs during the winter months. Also, it explains the fact that the best Prefrontal Fog formations occur in well marked zones immediately before the passage of the warm front but entirely in the preceding cold air mass. Very frequently the retreating cold air mass is Maritime Polar Air which is already so moist that only slight additional moisture and cooling by expansion is necessary to cause the formation of fog. If this air mass was formerly a warm air current from the south, cooled over the cold waters of the North Atlantic, it may already have Sea Fog or Monsoon Fog in it. Thus it is sometimes difficult to distinguish between the two unless complete observational data is at hand. Monsoon Fog may be recognized by the fact that it is an advection fog and normally appears first above the ground as a low stratus. Prefrontal Fogs, on the other hand, are formed locally with very light wind appearing first as a ground fog in low lying places and growing upward. They usually develop during a period of falling rain.

Other types of fog, occurring infrequently or not at all at Hadley, were considered in this study and explanations given for their appearance or non-appearance. The following conclusions were gained for the locality studied:

(1) That there is no period of the year which is really free of fog at all, though conditions seem to be best during the late spring and early summer.

(2) Fogs appear most frequently in the period from August to November, though they are seldom as troublesome during that period as are those that occur during the winter months, the latter fogs being more persistent.

(3) That dense smoke haze is restricted quite definitely to the months December through March.

(4) That Monsoon Fog has a distinct maximum from May through August, and Prefrontal Fog from November through March.

It is evident from this study that a record of careful observations over an extended period of time permits of the classification and explanation of the various types of fog occurring in the particular locality. The accurate forecasting of fogs, however, requires much more elaborate data than now exists.

New Volumes for the Shelves

FERROUS MATERIALS

Engineering Materials, Volume 1, Ferrous (Revised), *By Arthur W. Judge, Isaac Pitman & Sons, New York, 636 pages, $8.50.*

THIS volume is described as a thoroughly revised edition of "Aircraft and Automobile Materials (Ferrous)" by Arthur W. Judge, the eminent British technical author. Much as the method of giving chapter headings as an indication of the scope of a book is to be despised, it is resorted to in order to give an indication of the wide range of ferrous materials covered. Starting out with metallography, the author conducts us through wrought iron, cast iron, carbon steels, alloy steels, stainless steels, spring steels, manganese steels and tool steels, proceeding then to the commercial forms, treatments, furnaces, pyrometry, metal joining and surface protection, and concluding with high temperature and electrical steels. Broadly speaking, the book covers all phases of ferrous material use for automobiles and aircraft, both British and American. It is regretted that we must review with special emphasis on the phase which is least adequately covered—American aircraft practice.

The preface states "this book is intended expressly for the student and user of engineering materials, namely, the engineer and designer, as distinct from the metallurgist and chemist." This definite dedication, further amplified in the balance of the preface, invites the critical observation that if the designer and engineer in aeronautics were advisedly confronted with such a wide choice of materials from which to make selection, and exercised his option, the life of an airport field service man would indeed be an unhappy one. In presenting both automobile and aircraft steels, American and British, in an orderly parade which often leaves one in doubt as to which of the four possible combinations of uses a particular steel is applied to, as well as confused as to the specific purpose in each of these major subdivisions, with no knowledge as to whether in most instances the particular material represents current general practice or is merely experimental or historical, the designer and engineer will often be doubly confused.

Were this book confined solely to British practice, it would indeed be an interesting volume for the deep student and analytical materials engineer to utilize in broadening his own horizon beyond national boundary lines. However, since it does discuss and include American aeronautical practice, the great divergence between the impressions it gives and actual current practice cause one serious question.

Specifically, it states of stainless steels that "it is possible to braze this material but not altogether satisfactory to weld it," which is rather contrary to our practice, since the stainless steel most widely used in American aircraft may not be brazed but is welded. It further states that "nickel steel containing about 3½% of nickel is much used in America for tubing," and makes no reference to chrome molybdenum tubing, the most widely used alloy tubing. Referring to welded tubular construction, it advised that the use of welded tubular construction has been avoided in the past in Great Britain, cites Fokker as a sort of special user of the practice, and ignores current American welded steel tubular construction entirely. Pulleys are advised to be made of either brass, gun metal or aluminum alloy, while entirely neglecting the almost universal use of bakelite or other phenol fibre products in America. The information on protective coatings for both steel and aluminum alloy is far behind current American practice, and the statement that aluminum alloy fittings for underwater and exposed parts has been largely abandoned leaves one aghast. The impression that on American aircraft practice the author is not at all modern, is further advanced by the fact that the vast majority of referenced authorities are from ten to fifteen years old.

For the man who wishes to broaden his basic knowledge, this is a good book. For ready reference in seeking general information on some technical term encountered and not understood, the book is of extreme value. For an appreciation of the value of the metallurgist and the futility of haphazardly specifying ferrous materials, the book is an excellent salesman of the worth of seeking expert advice. But as a text book for the American aeronautical engineer, who would place his confidence in its authoritativeness, it is regretfully advised against.—John F. Hardecker

The Buyers' Log Book

Neon Obstruction Marker

THE Westinghouse Electric & Manufacturing Co. has produced a neon obstruction marker resembling a spread umbrella with six V-shaped neon tubes sloping downward from the center. The covering above the tubes consists of a cone-shaped hood to which a wire screen is attached. This screen protects the tubes from damage by weather. The U-tubes are connected in series. If one should burn out, an automatic cut removes it from the circuit and the marker remains lighted as long as there is one tube remaining. The possibility of more than one tube getting out of order at one time, however, is slight.

Westinghouse Neon Obstruction Marker

The distinction ball of red light, about 3 ft. in diameter, is said to be visible for a distance of five miles. The marker is for use on tall chimneys, towers, monuments, broadcasting antennae and unlighted buildings as a means of protection against low flying aircraft at night. Two types have been designed, one to operate from the ordinary house current, and the other directly from high voltage transmission lines.—Aviation, *September*.

DeVilbiss Spray Gun

ANNOUNCEMENT is made by The DeVilbiss Co. of Toledo, Ohio, of a new spray gun, Type BD, for the application of dope. This differs from other spray guns in that it is provided with a hollow needle around which the fluid leaves the nozzle of the gun in cylindrical form with air pressure within the cylinder to aid in the atomization of such heavy bodied and viscous material as airplane dope. The gun is said to afford a means of speeding up the process.—Aviation, *September*.

Caterpillar Grader

THE Caterpillar Tractor Co., Peoria, Ill., has now added to its line of road machinery a leaning wheel grader for use with the sixty tractor manufactured by the company. The new machine is the heaviest of the "Caterpillar" blade graders, weighing 11,300 lb. without scarifier, and introduces a new centralized control system by which seven control wheels govern the nine important adjustments of blade pitch and position, wheel adjustment and steering.

The grader features a 42 in. lateral side shift of blade that can cut a bank of 60 deg. slope and has a reach of 6 ft. 6 in. The entire lifting mechanism is mounted on roller bearings. A new construction is introduced for the knuckle arms of the leaning wheels, whereby a steel sleeve through the knuckle holds the heavy steel pin. The sleeve also acts as a spacer for the axle angles, allowing the nut on the pin to be drawn tightly up to maintain rigidity. The knuckles pivot on the sleeve.—Aviation, *September*.

Armstrong Tool Holders

THE Armstrong Bros. Tool Co., Chicago, announces a new line of holders designed to use high speed steel bits tipped with less than an ounce of Tungsten Carbide. It is claimed that these make the use of Tungsten-Carbide practical for machine shops and tool rooms. Because of the extreme brittleness of this new element the holders are made very rigid and are built out under the bit so as to give maximum support to the cutting edge. They are for use on lathes, planers and shapers and hold the bit parallel to the shank. Two general types are available, those broached for the standard square bits and those that take a deeper bit. The manufacturer states that these holders facilitate the machining of unusual materials, make it practical to machine hardened steels without annealing, sand filled castings and tough alloy steels, and also cut ordinary metals at increased machine speeds.—Aviation, *September*.

Navy F-1 Camera

THE newest camera manufactured by the Fairchild Aerial Camera Corp., 270 West 38 Street, New York City, is the Navy F-1, which was designed in conjunction with the U. S. Bureau of Aeronautics for taking oblique photographs in rapid succession. One use made of the camera is for photographing targets from the air after every salvo from the guns engaged in practice. Since the image of a watch reading is on each negative, it is possible to check on the effectiveness of each salvo.

The exposure is 5 in. x 7 in. By rotating the hand grip on the right side through an arc of 127 deg. and returning it to its regular position, the shutter is wound and fresh film drawn into place. The shutter is tripped by a thumb lever that can be operated without disturbing the grip of the hand on the hand hold. Either roll film or a cut film pack accommodating twelve sheets of cut film can be used. The camera is available without the recording feature and the following focal length lenses: 10 in., 7 in. and 20 in. telephoto.—Aviation, *September*.

A Correction

THE shock strut drawing on page 115 in the August issue of Aviation was the Rusco, manufactured by the Russell Mfg. Co., and not the Oildraulic as stated.

New Catalogs

▶ *Napier Aero Engines.* A very attractive loose leaf volume recently published by D. Napier & Son, Ltd., describes the construction and achievements of these engines in French, English and Spanish. Photographs are included illustrating many of the types of aircraft to which Napier engines have been fitted.

▶ *G. E. Industrial Control Catalog.* This publication furnishes information on representative lines of industrial control manufactured by the General Electric Co. It also includes instruction

in the care and operation of control devices, wiring diagrams of standard controllers, push buttons and other accessories, reference tables, and list of publications.

▶ *Lebanon Steel Castings.* A folder on this subject describes the use of Lebanon castings in cranes and hoists for industrial transportation.

▶ *New Standard Plane.* A catalog descriptive of the New Standard five-place plane has been issued by the company. Performance figures, specifications and equipment are listed. The booklet also contains a number of illustrations showing structural features, including a three view diagram.

▶ *Curtiss Crusader.* The Curtiss Aeroplane & Motor Co. has published a bulletin describing the Crusader engine and containing photographs, a complete diagram and power curve of the engine.

▶ *Airport Drainage Construction.* The Armco Culvert Mfgrs. Assn. has published Bulletin C-2 which outlines the requirements for airport drainage and contains useful diagrams and tables relating to this problem. The advantages of Armco perforated pipe for airport drainage are discussed.

Side Slips

BY ROBERT R. OSBORN

GOOD BEHAVIOR AT THE RACES

NOW that the annual National Air Races are with us again it occurs to us that there must be many newcomers to the races each year, who have no mother to guide them, so to speak, and have no idea how to act or what to wear for their first race meeting. To keep these newcomers from making star-spangled spectacles of themselves AVIATION has decided that a few notes on etiquette and good behavior might not be amiss. It is to be understood that these decrees and suggestions have been drawn up only after consulting great numbers of seasoned air race attenders and are therefore to be considered absolutely authentic and authoritative.

If you wish to attend any functions requiring a tuxedo, and there are a few, be sure to bring your own along. All of the tuxedos for hire in the entire town will be taken by the boys attending the booths in the exhibits.

The most important point to be kept in mind is that it is in very bad form to do any sleeping at all during the ten days of the races. Sleeping is considered an admission of deplorable physical weakness, comparable to taking naps in the afternoon when one was younger. The week following the races is given over entirely to sleeping by the rest of the industry. There won't be any business then anyway so you might as well sleep then and hold off during the races. Don't be worried if along toward the end of the week you acquire the mental condition similar to a thick fog and haven't any idea if you are attending a greyhound race or an Elk's convention. That is perfectly normal and will not be noticed as all the other visitors will be in the same condition. As for the results of the races, AVIATION always takes care of that detail for you by printing neat tabulated lists of the results after the affair. This saves you from any mental concentration on the races at all and you can devote all of your energies to keeping awake.

There is always some sort of a funny pass system in force. You are supposed to have a pink pass to get into the stand, a red one for a seat on the fifty yard line and a white one countersigned by the mayor to be allowed in the paddock to look the horses over before the race. Even if you are entitled to these passes you always lose them the first day so the best system is to look hard boiled and get up considerable speed in brushing by the ticket takers. This isn't so easy as it used to be when these ticket takers were just soldiers or policemen. Lately they have been hiring private detectives for this work so a good serviceable crash helmet might be useful in doing this trick.

At the end of each day's program there is always a very unimportant race, such as the free-for-all pursuit race, and this is considered a great time to demonstrate one's commercial ships. Dodging in and out among the racers on the take-off always impresses the customer with the maneuverability of one's ship. There will probably be a regulation forbidding flying at that time but of course that doesn't count unless it says "positively" no flying.

You can always find a very interesting group of people clustered about the hot dog stand and ice cream purveyors during the races. These are the time-keepers and they meet at these points to work out the times and speeds of the winners during any race. Just what system they use in determining these speeds has always been a mystery to all of us, but it is thought that they simply add from five to ten percent to the speeds of the winners from the previous year.

For side amusements during the race meeting, there are a great number and variety available. The favorite ones seem to be playing golf in the hotel lobby, utilizing vases, chairs, rugs and other suitable furniture along with umbrellas and canes for clubs—and arguing with the traffic cops. Another harmless and impressive diversion is to come in late and speak very mysteriously and admiringly about a beautiful actress. As for arguing with the cops, this seems to be inevitable and can be made very enjoyable if one knows how. It is easy to get out of any difficulty by introducing yourself as a famous aviator, having just won the Trans-continental race. Also introduce the other members of the party as famous aviators, promise the cop a ride if he'll come out to the field "sometime" and you're all set. Of course having "Official Car" on the front of your borrowed automobile always helps and these signs can be obtained in any stationery store.

It is not considered cricket to sell a man a large order of motors or ships when he is almost unconscious along toward the end of the week. This is not among the approved amusements. It is well understood by all that there is a sort of moratorium in effect during the race week and any papers or contracts that one signs are just in fun—anyone willing to pay a cash deposit on any purchases, though, is fair game for all salesmen.

For the duration of the races there is a closed season on stealing funnels and chamois from the gas trucks. While this is just good clean fun during the rest of the year, this obtaining of souvenirs from the fields one visits, it is not classed as better conduct during races.

Any one finding a tail skid dolly within an hour after starting to look for it should report the matter to the management at once, as this is an indication that the last man using it failed to return it to its proper hiding place.

Each year there is a jolly fight between the Army and the Navy in attempting to steal the show from each other. While this is all just in fun, it is not safe to cheer lustily for either service. If the service pilots miss a few balloons in the "balloon busting" contest or drop a few flour bag bombs in the stands instead of into the target in the middle of the field, one should not laugh lustily, nay not even gently. This business is all very serious to the enlisted personnel sitting near you in the stand and it might be very difficult to explain that black eye obtained in the middle of the afternoon.

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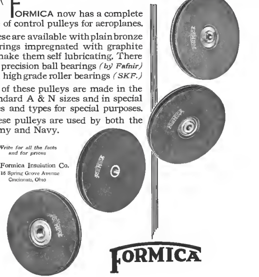

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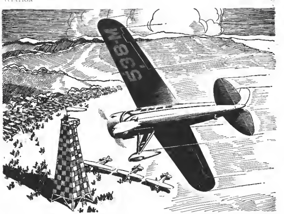

AMELIA EARHART — "first lady of the air" FLIES A LOCKHEED-VEGA

Among women pilots today, Miss Amelia Earhart is recognized as the outstanding personality — America's "first lady of the air." Her fame rests not only on being the first woman to fly the Atlantic but also upon her unusual flying ability. As proof of this she holds a number of women's speed records — made with her swift Lockheed-Vega

This summer, with the first standard model all-metal cabin Lockheed-Vega ever produced, she established three new international records for women within two weeks' time—a speed rate of 174.9 miles per hour over a 100 kilometer course (62.13 miles) with plane empty — a rate of 171.5 miles per hour over the same course with a load of 1103 pounds—and a rate of 181.18 miles per hour over a 3 kilometer course (1.86 miles).

It is significant that Miss Earhart chose a Lockheed as her personal plane. Everyone knows that Lockheed is the world's fastest commercial airplane — but experienced pilots know in addition that it is the easiest ship to handle. That is one reason why Miss Earhart selected a Lockheed.

For speed—and safety—Lockheed is unmatched. It flies faster and lands more slowly than any plane of its power or weight — controls perfectly even under stalling speeds. Whether there is a woman pilot at the controls or a man, "it takes a Lockheed to beat a Lockheed."

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AIR FERRIES, LTD.
PAN AMERICAN-GRACE AIRWAYS, INC
N. Y. R. B. A. LINES
AND LEADING ENGINE MANUFACTURERS

Announces STANAVO AVIATION GASOLINE

Made under the same direction ····sold through the same companies as its famous companion STANAVO AVIATION ENGINE OIL · · · · · ·

A new and superior engine fuel—

STANAVO AVIATION GASOLINE is rapidly being made available at airports throughout the country.

At last an aviation gasoline which exactly meets the needs of aviation; non-detonating, uniform, stable in storage, non-gas-locking, developed through long and varied research and experimentation by the most experienced producers of petroleum products. Another Stanavo contribution to the advancement of aviation.

Already in use by leading air transport operators of North and South America.

Like Stanavo Aviation Engine Oil, STANAVO AVIATION GASOLINE is made under the supervision of and according to the specifications of the Stanavo Specification Board, Inc. In every way it is Aviation's finest gasoline.

A New AND SUPERIOR *Gasoline*

—Reduces engine temperatures—wear of cylinder walls and rings—oil consumption.

—Retains its original qualities even after long storage in tropical temperature.

—Is non-detonating at full throttle, even in the largest commercial air-cooled engines

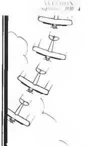
—Made to the latest rigid anti-gas-lock specifications

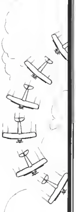
One Brand—STANAVO—One Quality—the Highest Throughout the World.

STANAVO

AVIATION ENGINE OIL & GASOLINE

STANAVO SPECIFICATION BOARD, INC.
Organized and maintained by
STANDARD OIL CO. OF CALIFORNIA   STANDARD OIL CO. (Indiana)
STANDARD OIL CO. OF NEW JERSEY





Where the California condor flies

All the comforts of a yacht

PACKARD-DIESEL optional equipment on FORD TRANSPORT

AMONG the first manufacturers of aircraft to offer planes equipped with Packard-Diesel engines was the Ford Motor Company — manufacturers of the famous Ford all-metal tri-motored transports. The 9-11 passenger Ford Model 11A is available with three 225 horsepower Packard-Diesel powerplants.

What the Ford aviation experts think of the Packard-Diesel is best illustrated by excerpts from a recent folder featuring the Ford Model 11A:

"SAFETY. Diesel engines use fuel oil, reducing the hazard of carrying a highly volatile fuel. · · Diesel engines are used for marine work and pumping stations because of their ability to continue operating for long periods. · · Diesel engines have no carburetors, spark plugs or magnetos, thus eliminating those causes of engine failure.

"ECONOMY. Diesel engines burn low-priced fuel oil which carries no gasoline tax. · · Diesel engines use about 20% less fuel by volume than gasoline engines of the same horsepower—an additional saving. · · Fuel is an expensive item in flying—Diesel engines decrease both the cost and quantity.

"NO RADIO INTERFERENCE. Due to the Diesel engines having no magnetos, no radio shielding is required. · · The magnetic compasses are freed from magneto interference."

Packard-Diesel Engines are bringing new safety and new economy to flying—giving "new impetus to flight."

A S K   T H E   M A N   W H O   O W N S   O N E

STEEL HANGARS WOULD HAVE SAVED CROYDON FIELD $600,000 IN SCRAPPED BUILDINGS

This all-steel individual hangar belonging to Squadron V.T. 31, U. S. Naval Reserve is incombustible and, in accordance with military requirements, can be moved to other fields if necessary, at minimum cost.

Airport, Croydon, England

WHEN YOU BUILD . . . BUILD OF STEEL

ALL-STEEL HANGAR CONSTRUCTION CAN BE REMODELED AT SMALL COST TO MEET CHANGING NEEDS ▲ ▲ ▲

All-steel hangar of the Curtis Flying Service, Valley Stream, Long Island, N. Y., can be easily remodeled and enlarged to meet future flying equipment requirements.

LACK of imagination and foresight into future housing needs of aviation has caused many an airport thousands of dollars loss in obsolescent buildings . . . In a recent report the announcement was made that the cost of rebuilding the Croydon airport two years ago was $1,000,000 and the original cost of the buildings scrapped was $600,000[1]

The flexibility of all-steel hangars . . . speedy erection . . . adaptability to provide extensions and changing conditions . . . portability . . . moderate cost . . . practically 100% salvage value . . . incombustible and wind-proof are features that have popularized this type of construction.

If you want the complete facts of building for future aviation with steel, get in touch with the Trade Research Division, National Association of Flat Rolled Steel Manufacturers, 511 Terminal Tower Building, Cleveland, Ohio.

Steel desks and office furniture save depreciation and loss by fire

Save

with Steel HANGARS

Two Giants proved worthy
so they bought three more

TWO Fokker AF-32's were put in service between San Francisco and Los Angeles by Western Air Express. Each carries 30 passengers by day, 16 at night. Fare charged: railroad fare plus Pullman.

These giants proved safe, comfortable, economical. So Western Air Express ordered three more for use on their western lines, giving them the five largest airplanes in America in daily operation.

Each is powered by four 575 h. p. Pratt & Whitney Hornet engines. Top speed, 146 m. p. h.; cruising speed, 120 m. p. h.

The comfort of these big planes is maximum and their economy of operation, unique. Their great capacity and efficiency make the cost per person surprisingly low.

Fokker will gladly demonstrate the performance of the AF-32's and other models suitable to every transportation requirement. There are new low prices on many models which it will pay you to investigate. General Motors purchasing power assures lowest possible prices on all Fokker planes.

For the use of business executives for pleasure, and for transport use, Fokker now makes ten different models of airplanes single and multi engined types, land planes, sea planes, flying boats, amphibions. Requests for information or demonstration are invited, and will be promptly answered. Fokker Aircraft Corporation, General Motors Building New York.

FOKKER

AFFILIATED WITH GENERAL MOTORS CORPORATION

"Thanks to the
IRVIN AIR CHUTE"
The Life-Preserver of the Air

—writes Jack Webster, N. A. T. Pilot, as he sent us this picture following his emergency jump in which it saved his life in Connecticut.

WE are grateful for this expression of appreciation just as we are that there are many other famous Air Mail Pilots who are flying their courses today because they had their trusty IRVIN's when most needed.

Leading commercial operators, just like leading government air forces, the world over, have been thus using—and saving lives—with IRVIN Air Chutes during the past ten years.

To you, one important result of this universal confidence in IRVIN Chutes, is that there are now hundreds of qualified IRVIN service men familiar with its packing and use. IRVIN Air Chute knowledge, equipment and confidence is thus available to you wherever ships fly.

Put your parachute problems up to us. Write us for suggestions as to how to meet the new Department of Commerce Regulations effective August 1st, governing use of parachutes in training and exhibition jumps.

Write today.

IRVING AIR CHUTE CO., Inc.
372 Pearl St., Buffalo, N. Y.
West Coast Factory and Office: Grand Central Air Terminal, Glendale, Calif.
Canadian Factory: Bridgeburg, Ont.

"Happy Landings" our motion picture on standard width film showing IRVIN Air Chutes in action is available free of charge to schools, clubs and organizations interested in aviation. Send for booklet and particulars.

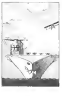
When they catapult "CORSAIRS" at sea

In the Navy, "Corsairs" are catapulted from battleships, accelerating from rest to flying speed in a matter of split seconds. They are landed in all kinds of seas and picked up by cranes. As landplanes they take off from the decks of aircraft carriers and land into arresting gear. Such use sets up strains far greater than those met by airplanes in any other service.

For experienced airmen the appeal of the Vought "Corsair" is based on the extreme ruggedness of design which underlies its beauty. This is not merely a well designed ship with superb performance in the air and unusual ability to get into and out of small fields. The "Corsair" is built to stand up in constant use under the most severe operating conditions.

Private owners find keen satisfaction in the distinctive qualities of the "Corsair" which have earned the ship its enviable operating records in the service of the Navy and Marine Corps. CHANCE VOUGHT CORPORATION. Division of United Aircraft & Transport Corporation, East Hartford, Connecticut

CHANCE VOUGHT



CORPORATION

"FINE MATERIAL"

Increased pay now rewards PARKS *graduates*

READ THIS WIRE

PARKS-trained men are up on their toes—alive, alert, eager—and thoroughly confident of success. That's why they find it! Certainly, there's room for this type man in Aviation! How much longer will *you* hesitate? The time to decide is NOW! A fleet of training planes awaits your arrival. One of them will be assigned to you, on regular periods. The complete facilities of "the world's greatest air college" will be yours to command. You'll meet men from all over the country—talk with flyers whose experiences beat any "best seller" for thrills—"tinker" with motors and instruments—study navigation, aerodynamics, all the secrets of flying—*Man! what a treat is in store for you!* Aviation is young. It needs men—trained men—PARKS-trained men. *Equip yourself!* Be ready when the call comes "Send us more men." Mail the coupon today.

BY DIRECT WIRE FROM
WESTERN UNION

A2 40 RL=TCS BURBANK CALIF JUN T8

PARKS AIR COLLEGE=

ATTERTION OLIVER L PARKS EASTSTLOUIS ILL=

YOUR PARKS GRADUATES SENT ON APPROVAL HAVE ENDED PROBATION TERM ARD ARE CONSIDERED FINE MATERIAL WITH INCREASED PAY STOP SATISFACTORY SEND MAN MENTIONED YOUR WIRE UPON SAME WORKING BASIS STOP ADVISE EXPECTED ARRIVAL HERE STOP REGARDS TO YOU ARD BRAYTON=

LOCKHEED AIRCRAFT CORPR
CARL B SQUIER

803A JUN T9.

MAIL YOUR COUPON TODAY

Parks students find something of interest for every minute of the day. Here's a group at work in the Engine Shop

Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school

PARKS AIR COLLEGE
DIVISION OF DETROIT AIRCRAFT CORPORATION
983 Parks Airport
EAST ST. LOUIS ILLINOIS

COUPON

PARKS AIR COLLEGE,
983 Parks Airport, East St. Louis, Ill.

Without cost or obligation to me, please mail your illustrated catalog.

Name ....
Street address ....
City .... State ....
Occupation .... Age ....

I am interested in
Pilot's Course ☐
Mechanic's Course ☐

WHAT CONSTITUTES PERFORMANCE?

1. DEPENDABILITY

Dependability is as much a function of design as it is of development and production. Continental offers dependable design . . . confidence that competent engineering intellects devote themselves to your specific problems, testing and trying each creation of the drafting rooms in modern laboratories; dependable development . . . physical facilities that are worthy of your trust, for millions of motors prove that they may be relied upon; dependable power . . . aircraft engines that are the product of such dependable design and development. They are Precision Built.

"Approved Type Certificate No. 32, U. S. Department of Commerce"

CONTINENTAL AIRCRAFT ENGINE CO.

General Office and Factory Detroit, Michigan

Continental Engines

Drawing upon the facilities and experience of the greatest engine builder in the world, Continental is uniquely enabled to counsel with the trade in the design and production of engines to fit individual requirements.

FAMOUS FLIGHTS WITH THOMPSON VALVES

(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)

In the First *Air Conquest of the* PACIFIC OCEAN

Among the world's foremost pioneer airplane flights was the feat of Lieutenants Maitland and Hegenberger three years ago. Taking off from the Oakland Airport, California, in a U. S. Army Fokker, equipped with three Wright "Whirlwind" motors, they set their course over unexplored air lanes, with the tiny island of Hawaii as their goal.

Their arrival in Honolulu after 25 hours in the air brought world-wide recognition of the supreme navigating skill of these daring pilots . . . and of the utter dependability of their engines.

• • •

Important contributors to the success of this flight were the 54 Thompson Valves that made possible perfect engine performance. Repeated demonstrations of unfailing ruggedness such as this in outstanding American record flights have led to the adoption of Thompson Valves for today's finest American airplane motors.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT

Thompson Valves

The New Safety Factor:

*Penetrative Lubricity,** which has aroused so much interest in the Automobile world, now finds its truest use in motors that fly . . . .

WITH THE ANNOUNCEMENT, late in 1929, of the sensational new Germ-Processed Lubricants, one outstanding characteristic seemed to immediately represent all that was new and better about them.

This characteristic was *Penetrative Lubricity*, an oily, metal-penetrating quality which protects moving parts during starting periods, and provides an adequate protective film which never leaves the working surfaces.

In the automobile world thousands of oil and car dealers and millions of motorists have greeted this new oil as the long-needed lubricant for high-speed motors. Tests prove that there is a margin of safety and economy in the tenacious film of this oil that is unmatched by other oils.

And now—there is a Germ-Processed oil for Aviation motors —CONOCO *Aero Germoil*.

This new lubricant brings to the flying business an enviable reputation earned in what is perhaps the most highly competitive field in the world, the American oil market. It brings to aviation the results of experiments which started at about the time of Glenn Curtiss' New York-to-Albany flight two decades ago.

Aviation has needed an oil like this. For the importance of the safety factor of this oil in a flying motor is multiplied by the value of human life.

All motor oils drain away from the motor during idle periods and require from 5 to 20 minutes to get back "on the job" after the first turn of the prop. But CONOCO Aero Germoil, with its ability to penetrate metal surfaces leaves a protective film which provides *instant* starting lubrication. Therein lies the difference. There can be no doubt in any mind as to which is the best oil. These characteristics in Aero Germoil mean decreased motor wear, more hours of air service between overhauls, and a greater motor-dependability at all times.

Once the facts become known, Aero Germoil will become the pilots' favorite . . . just as our automobile motor lubricants have become America's fastest-selling oils, because of the Germ Process, and Penetrative Lubricity!

**MEANS* . . . Slipperiness, smoothness, freedom from friction, also the property that diminishes friction, as the *lubricity* of oil, coupled with the unique ability to penetrate metal surfaces.

CONOCO AERO GERMOIL

CONTINENTAL OIL CO.

PONCA CITY, OKLAHOMA
ALBUQUERQUE, NEW MEXICO
SALT LAKE CITY, UTAH
WICHITA FALLS, TEXAS

NEW YORK, N. Y.
KANSAS CITY, MISSOURI
GREAT FALLS, MONTANA
(CONOCO OIL CO.) CHICAGO, ILLINOIS

DENVER, COLORADO
RICHMOND, VIRGINIA
BUTTE, MONTANA
LINCOLN, NEBRASKA

IN DISTINGUISHED COMPANY

The popularity and worth of the Heywood Starter is well evidenced by the company it keeps. For on one or more models manufactured or used by the following representative concerns the Heywood is standard equipment.

American Aeronautical Corp (Savoia Marchetti) · American Eagle Aircraft Corp. (Wallace Touroplane) · Detroit Aircraft Corp (Eastman Division) · Fleet Aircraft Corp. · Goodyear · Huntington Aircraft Corp. Ireland Aircraft Co. · Mohawk Aircraft Corp. · Sikorsky Aviation Corp. Stout Air Lines · Travel Air Co. · Verville Aircraft Co. · Waco Aircraft Co.

This wide acceptance of the Heywood Starter is due to its great dependability — the gas injection principle means unfailing service — and the benefits and comforts derived from the convenience of starting from the pilot's seat—*Write for details.*

SKY SPECIALTIES CORPORATION
3651 Hart Ave. - - Detroit, Michigan

HEYWOOD STARTER

Flying is a year-round business....

The way to make money in airports is by year-round operation . . . . .

The ports which make money are the ports which are prepared to operate every day in the year. They won't be forced to close when the weather turns bad—when alternate freezing and thawing destroys unpaved runways and makes landings dangerous and take-offs impossible.

Your ability to operate under all weather conditions may mean the difference between profit and loss . between getting a transport contract and not getting it . between attracting passenger business and driving it away. Especially in uncertain fall and winter weather you need surfaced runways—Tarmac runways. More than ever you need smooth, skidproof, durable Tarmac surfaces to eliminate the hazards of mud and slush and frozen, broken ruts.

Don't let bad weather stop you, or even slow up your operations... and your profits. You're in a year-round business, and Tarmac will keep you there... steadily, profitably... by a small investment.

Write for information on construction methods and costs on Tarmac.

Surface

RUNWAYS
PARKING AREAS
HANGAR APRONS
CONNECTING ROADS
TAXI STRIPS

at moderate cost with **Tarmac**

AMERICAN TAR PRODUCTS CO
Division of The Koppers Company
GENERAL OFFICES. PITTSBURGH, PA.
New England Division
Tar Products Corporation, Providence R. I.

SPECIFICATIONS

Laird Speedwing Senior and P. & W. 450 H. P. Wasp

An entirely new idea of flying speed will have to be devised to fit this great new ship. With cruising and top speeds far in excess of any present-day commercial airplane, the Speedwing Senior is still a thoroughly practical sport and business ship—luxurious, accessible passenger cock-pit forward of the pilot's seat, two spacious storage compartments behind. Customized throughout—special instruments and fittings. Designed for the man who will not be beaten—by man or weather

◀ 1930 ▶

LAIRD carries on a tradition of LEADERSHIP

● In the autumn of 1913, hangers-on at the old Cicero Flying Field, Chicago witnessed the initial flight of the first Laird airplane. Indulgent smiles and skeptical wagers on its ability to get off the ground greeted the little craft powered with its 12 H. P. four-cylinder engine.

● And then the Laird "Baby Biplane" startled on-lookers by not only flying successfully, but by equalling the performance of airplanes with three times its power. E. M. Laird, designer, builder, and pilot, had succeeded in replacing brute power with aerodynamic efficiency—had built the lowest-powered successful airplane up to that time.

● In 1920, E. M. Laird again made aviation history by designing the Laird Swallow—first of the truly commercial airplanes—and grounding the American aviation industry at Wichita with the organization of the E. M. Laird Airplane Co.

● The same genius for design and a determination to build only the finest of aircraft has characterized every ship to leave the Laird shops. During the past few years, Laird Speedwing and Standard Wing models have piled up record upon record, testifying to superior aerodynamic efficiency and dependability of operation.

● And now the Speedwing Senior! With cruising and top speeds far above the standard of present-day commercial and military airplanes, the Speedwing Senior sets a new mark to shoot at—carries on the Laird tradition of leadership.

◀ 1913 ▶

◀ 1920 ▶

Distributors : Exclusive territories available for established firms with funds and demonstration facilities suitable to handle Laird sales.

E. M. LAIRD AIRPLANE COMPANY
Not connected with any other manufacturer of airplanes
4500 West 83rd Street, Ashburn Field, CHICAGO, ILLINOIS

"THE THOROUGHBRED OF THE AIRWAYS"

THERE IS A BIG DIFFERENCE IN AIRPORT SURFACING

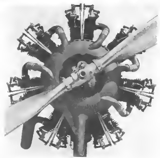
Compare the two landing and take off runways pictured
①—A Gilmore Plastic surfaced airport ... built with Gilmore Special Asphaltic Airport Oil.
②—A landing and take off runway thoughtlessly recommended for and installed in a prominent western airport.

Ask any experienced flyer which would be his choice, then ask yourself the question ... "Why trust my surfacing problems to other than the expert?" Then submit your problems to the Gilmore Oil Company Ltd., 2423 E. 28th St. Los Angeles, Cal.

GILMORE
Special Asphaltic
AIRPORT OILS

201A

SMOOTHER POWER



Presenting . . the JACOBS MOTOR

RATED H. P.—140 at 1900 R. P. M.
MAXIMUM H. P. AT SEA LEVEL —160 at 2000 R. P. M.
WEIGHT OF ENGINE—DRY— —390 lbs
NUMBER OF CYLINDERS—7
DISPLACEMENT—528 Cu. In
BORE—4½ In.
STROKE—4¾ In.
COMPRESSION RATION—4.8—1
OVERALL DIAMETER—44 In
OVERALL LENGTH 33 In.

A. T. C. 31

A new, simpler, smoother motor than you have ever seen before. All adjustable parts visible and accessible for instant adjustment—simple in design—every part made of highest grade heat-treated alloy steel and aluminum—Dependable under every condition—Built to stand the most rigorous use.

In this motor, Jacobs brings to Aviation the engine for which the industry has been waiting.

Motors in service have flown 500 to 600 hours with not a replacement—Valves run 200 to 300 hours without grinding.

Now standard on the Waco 140

JACOBS AIRCRAFT ENGINE CO.

CENTRAL AIRPORT

CAMDEN, NEW JERSEY

RESEARCH

Measured in terms of service

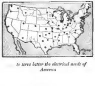
GREATER economy in the generation of electric power . . . more efficiency in its transmission and distribution . . new and improved apparatus to make its use more profitable . . . General Electric Research Laboratories, the largest in the world, have contributed more than any other to these present-day achievements

Research in pure science means something very definite to you It has made possible the electrical industry which serves you. It has aided in the perfection of the electrical equipment that you use to make a profit *Measured in your own terms of service,* General Electric research has helped you to develop your own business to its present size, and will continue to do so.

In addition to these advantages of General Electric research, you know that all General Electric products are thoroughly tested for quality before they are allowed to bear the General Electric Monogram You can use them in your plant with confidence that they will give satisfactory service for many years You can offer them in the products that you sell, to cash in on the enormous prestige of the General Electric name

The General Electric Supply Corporation, with over 80 wholesale warehouses strategically located throughout the United States, makes these direct and indirect benefits of General Electric Research *immediately available to you.* All communities are reached within a few hours—many in minutes When you have an electrical need—write!

Join us in the General Electric Program, broadcast every Saturday Evening on a nation-wide N B.C network.



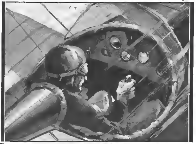
to serve better the electrical needs of America

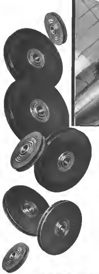
GENERAL ELECTRIC
SUPPLY CORPORATION

GENERAL OFFICES . . . . BRIDGEPORT, CONNECTICUT

IMMEDIATE RESPONSE

When Your Control Pulleys Have Precision Ball Bearings





INSTANT and dependable control, and a new sensitiveness to your will, come to your ship when your control pulleys are fitted with PRECISION Ball Bearings. You have a feeling of added ease and safety.

Both metal and moulded control pulleys, in all sizes and types, can now be had equipped with NORMA-HOFFMANN PRECISION BEARINGS. They hold the pulleys rigidly in line—prevent fouling the supports—make controls instantly responsive by reducing friction—are dirt-and-moisture-proof—are packed with lubricant sufficient for the life of the ship.

For safety and ease of control, see that your equipment includes Control Pulleys fitted with PRECISION Ball Bearings.

Let our engineers aid you with a highly specialized experience.

"NORMA-HOFFMANN"
PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

PAGE FENCE offers you 4 METALS to choose from

Page Fence long ago had arrived at such excellence that the only way to give it a longer average lifetime was to vary the metal used in its construction according to local conditions of exposure. This, even, is now an accomplished fact. Page Fence comes in four different metals, selection being made according to local atmospheric conditions. Our fencing experts in your territory will be glad to advise you the kind of Page Fence that will give you the longest service.

1. Page Aluminum Fabric
(Highly resistant to corrosion)

2. Page Armco Ingot Iron Fabric
(The purest and most uniform of all ferrous metals)

3. Page Copperbearing Steel Fabric
(Heavily galvanized after weaving)

4. Page Ornamental Wrought Iron
(The metal that serves for centuries)

LINEPOSTS—*Tabular or H Section*

64 *service plants*

The Page Fence Association offers this highly personalized service to their clients. The selection and erection of a fence to perform the required duty and last the longest is not a job for the inexperienced or one to be undertaken lightly.

For that reason, Page maintains a staff of experts, distributed through 64 plants scattered throughout the whole country. These experts will assist you in the selection of the proper kind of fence for your purpose and will superintend its erection, thus insuring your satisfaction.

Page Service Plants maintain a permanent interest in your fencing. You are free to call upon them at any time. This is the policy that for forty-seven years has maintained Page's leadership in the fencing field. Write today for interesting literature and for name and address of distributor nearest you. Page Fence Association, 520 N. Michigan Ave., Dept. A28, Chicago, Ill.

▼

PAGE

America's first wire fence — since 1883

ARMCO

Fence of Armco Ingot Iron fabric is exclusive with Page

FENCE

AMERICA'S FIRST WIRE FENCE - *SINCE* 1883

THE HIGHWAYS OF THE AIR MEET AT WELL-LIGHTED PORTS

Complete Lighting Service
for an "A" Airport

WESTINGHOUSE Chromlite Landing Field Projectors provide safe, flexible and efficient illumination on landing areas. Every constructional detail is the result of careful study over a period of years.

Safe, because the studies of preliminary designs were made from the air—from the view point of the pilot.

Flexible, because the principles of illuminating engineering dictate that flexibility is an essential requirement of landing area lighting.

Efficient, because every precaution has been taken to insure optical accuracy and maximum light output. The permanency of chromium-plating assures that the reflector will maintain its initial efficiency.

Westinghouse Airport and Airway Equipment includes

- Beacons
- Wind-direction Indicators
- Boundary Lights
- Floodlighting Projectors
- Ceiling Projectors
- On-course Lights
- Alidades
- Flush-type Marker Lights
- Directional Beacons
- Obstruction Lights
- Landing Field Projectors
- Panelboards
- Underground Cable
- Hangar Lighting Equipment
- Regulators
- Time Switches
- Isolating Transformers (safety coils)
- Switches
- Lamps
- Motors

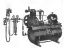
Westinghouse Specialists will help you plan an effective lighting system

Westinghouse

T 31412

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING

Model MK-863,
Heavy-Duty
Air Compressor



Model PSE-6
Paint Spray Unit

U. S. Electro
Hy-Press Grease
Gun

U. S. Engine
Cleaner

—Inspires Confidence In Ground Service

THE very fact that successful flying is so very dependent upon GOOD service in the hangar, means that there will always be a critical interest in SERVICE EQUIPMENT.

The confidence that pilots and ground men alike have in hangar equipment bearing the familiar U. S. trade mark is a direct reflection of the confidence that automotive men have felt since the beginning of the automobile industry.

The United States Air Compressor Co.
5348 Harvard Ave., Cleveland, Ohio

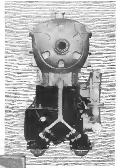
THE U. S. AIR COMPRESSOR COMPANY
5348 Harvard Ave., Cleveland, Ohio
Please send me your new bulletin on U. S. Hangar Equipment

Name

Address

City

Lowest Weight Per Horse Power *of any Engine* below 200 H. P.



AMONG the outstanding advantages of the new Chevrolet 333 (A. T. C. No. 59) is its extremely low weight per horse power—2.16 lbs. This is the lowest of any engine below 200 H. P. Its official rating is 120 H. P. at 2100 r. p. m. Its dry weight is 260 lbs.

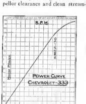
Other remarkable features of this new air-cooled, inverted "4-in-line" aircraft motor are its *low* fuel consumption—48 lbs. per B. H. P. Hr. at full horsepower; and its *high* B. M. E. P.—136 lbs. per square inch, the highest of any engine ever tested by the Bureau of Standards.

The exceptional performance of the Chevrolet 333 is a triumph of advanced engineering plus the application of "Balanced Design." Each part was individually designed to do its specific task, thereby insuring harmonious coordination of the whole. The result is unusually smooth operation and freedom from vibration.

"Upside down is right side up"
-- LOUIS CHEVROLET

Famous for over two decades as a designer, builder and driver of commercial and racing motors, Louis Chevrolet now offers the aircraft industry a revolutionary advancement in aircraft engine design—the inverted, air-cooled Chevrolet 333

The "upside down" construction of the Chevrolet 333 is also a forward step in aircraft engine design. It permits greater visibility, higher propellor clearance and clean stream-lining. It results in greater dependability, too. Unusual cooling efficiency is secured by a combination of design and arrangement. The exhaust port directly below the head makes it possible to cool the cylinders evenly. Valves last longer and work better because all valve gear is kept in a constant bath of oil.



Furthermore, the pilot or mechanic has only one oiling job—putting oil in the oil tank! There are no rocker arms or push rods to oil and grease. No valve clearances to check and adjust. Care and maintenance of the engine are reduced to a minimum.

Write for descriptive literature, giving further information and specifications. Chevrolet Aircraft Corporation, Baltimore, Md., U. S. A.

ENGINES
CHEVROLET
AIRCRAFT CORPORATION
BALTIMORE, MARYLAND

The New CHEVROLET 333

INVERTED 4-IN-LINE AIRCRAFT ENGINE

More precious than the price

DEPENDABILITY is the first consideration of Fairchild engineers. Vital as this quality is in all airplanes, it is especially important in Fairchilds, which are largely flown to and beyond the frontiers of civilization. When a pilot has left all bases behind, with their supplies of parts and their repair facilities, Fairchild's high standards of dependability increase his confidence. These ships have been watched in performance over a period of years, and steadily developed and improved in the light of both technical theory and flight experience throughout North and South America

Hence the ability of Fairchild Airplanes to take off, day after day. As a general thing, Fairchild owners find their service work reduced to the minimum of overhauls based on flying time. Between those overhauls the usual routine inspections, facilitated by easy access to all parts, usually are sufficient

Many unusual design features make this dependability possible. Forgings, stampings and bronze castings, for instance, are used liberally for small parts where cheaper but less reliable construction might be employed In every part of these ships there is stamina to withstand conditions more exacting than those ordinarily encountered Yet, by the proper choice of materials that combine lightness with strength, disposable loads are maintained at a high level Write for complete information covering these unusually dependable, exceptionally useful ships

FAIRCHILD AIRPLANE
MANUFACTURING CORP

Plants Farmingdale, L. I., N Y , Hagerstown, Md , Longueuil, P Q., Canada

Export Offices 122 East 42nd Street, New York City
Division of The Aviation Corporation

FAIRCHILD KR-34— A.T.C 162— THREE PLACE

Powered with Wright J-6 165 hp engine Bendix brakes, Fairchild oleo landing gear dual controls and adjustable pitch metal propeller are all standard equipment Other items of standard equipment air speed indicator compass altimeter gasoline gauge tachometer booster magneto oil pressure and temperature gauges engine cover cockpit covers log book tools, first aid kit, fire extinguisher, engine instruction books and wiring for navigation lights Low pressure tire equipment available at slight extra cost

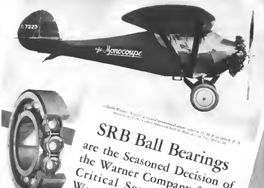
FAIRCHILD KR-21 SPORTSTER — A.T.C. 215— TWO PLACE

Powered with Kinner 100 hp engine Complete equipment includes air speed indicator compass, altimeter tachometer oil pressure and temperature gauges gasoline gauge booster magneto engine cover cockpit cover tools fire extinguisher first aid kit engine instruction book and log book Oleo landing gear dual control and full cockpit upholstery are standard equipment. Brake equipment and low pressure tire available at slight extra cost

FAIRCHILD KR-21 TRAINER

For training the KR-21 can be secured without upholstery air speed indicator compass, cockpit covers, propeller spinner and a few other items of equipment

FAIRCHILD
AIRPLANES



SRB Ball Bearings are the Seasoned Decision of the Warner Company for All Critical Service Points in Warner Aeronautical Engines

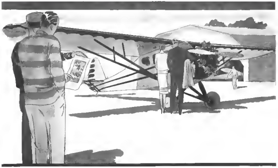
THE unusual capacity of SRB Ball Bearings to take crankshaft radial loads, absorb propeller thrust and support rocker arms is proverbial in the aeronautical industry... SRB, with its maximum number of large balls, hot-forged from molybdenum steel, give the utmost in dependability and reliability.

Ball SRB Bearings

STANDARD STEEL AND BEARINGS INCORPORATED
Plainville DIVISION OF MARLIN ROCKWELL CORPORATION *Connecticut*

PACIFIC COAST DISTRIBUTORS
F M Cobbledick Co San Francisco Cal E D Maltby Co Los Angeles Cal
Northwest Bearings Co Seattle Wash

Flashing performance with utmost economy



IF your preference is for a closed plane with all the comfort and luxury of surroundings that such flying affords—then the Warner-powered Mono Coupe is just built to suit your requirements.

Flashing performance with utmost economy describes its capabilities in the fewest possible words.

For the Mono Coupe will give you a cruising speed of 125 miles per hour on a consumption of 7-1/2 gallons Total cost for gas and oil will not exceed $2.00 an hour —or reduced to other terms 1-6/10 cents per mile Here is inexpensive transportation —de luxe.

Ask the nearest Mono Coupe distributor for a demonstration and enjoy the thrill of high speed flying in your normal street attire. Then realize that part of the brilliant performance you are experiencing is due to the smooth flow of power output of the small diameter, low head resistance Warner Scarab with which it is powered

Warner Scarab economy has become as widely recognized as Warner Scarab performance and reliability This economy is not only in actual operating costs but in maintenance and replacement costs during the entire life of the engine, which will outlast any other on the market Every part in a Warner that is subjected to wear, however slight, is readily and quickly replaceable

WARNER AIRCRAFT CORPORATION
DETROIT, MICHIGAN

WARNER "Scarab" ENGINES

Ventilator formed of Bakelite Molded, used in cabin planes by Fokker Aircraft Corp

CABIN VENTILATORS OF BAKELITE MOLDED ARE UNAFFECTED BY EXPOSURE

Adverse weather conditions—wind and rain, snow and ice—have no harmful effect on Bakelite Molded cabin ventilators. The hard lustrous surface of this non-hygroscopic material is impervious to moisture, and is non-corrodible. In Bakelite Molded, light weight is combined with strength, which makes it particularly desirable for aircraft use.

Bakelite Molded parts, such as this ventilator, are formed in one press operation, and leave the mold with a smooth, lustrous surface that requires no buffing or burnishing. The parts are accurate in dimension and flawless in detail Any number of like parts may be formed in a mold, and perfect interchangeability assured

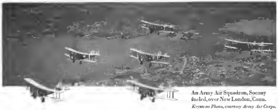
The use of Bakelite Materials in aircraft construction is steadily increasing They are now standard for ignition systems and instrument cases, and are successfully used for paneling, propellers, control knobs, lighting fixtures and other purposes Write for Booklet 59M, "Bakelite Molded".

Bakelite *Engineering Service*—We manufacture a wide variety of Bakelite resinoid molding materials, varnishes, lacquers, enamels, cements, and other products Twenty years experience in the development of these materials for mechanical and other uses provides a valuable background for the cooperation offered by our engineers and laboratories.

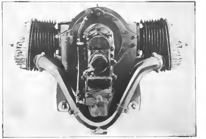
BAKELITE CORPORATION, 247 Park Avenue, New York. CHICAGO OFFICE, 635 West Twenty-second Street
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

BAKELITE

THE MATERIAL OF A THOUSAND USES



An Army Air Squadron, Socony fueled, over New London, Conn.
Keystone Photo, courtesy Army Air Corps.



Aeronca Selects GOVRO-NELSON

IN CHOOSING the builder of their new engine, the E-107 A, the Aeronautical Corporation of America, selected Govro-Nelson.

For their ship the Aeronca, they demanded an engine of unusual strength and ruggedness. They demanded an engine built to get up there and take hour after hour of gruelling work, carrying plane and passenger with unfailing safety.

In Govro-Nelson, they found a shop well equipped with skilled engineers, accurate production equipment and the most precise checking instruments — a shop with a carefully gathered reputation for accuracy in the manufacture of precise parts for aircraft, that well deserved their confidence.

Wherever consistently fine work is desired, the facilities of Govro-Nelson are an asset that leading builders of aircraft utilize with unhesitating confidence.

Unerring precision is incidental in all products of the Govro-Nelson shop.

AIRCRAFT NEEDS THIS PRECISION

THE high degree of accuracy and exacting precision of parts made by Govro-Nelson explains why many leading builders of aircraft engines specify Govro-Nelson products to uphold records of remarkable performance

GOVRO-NELSON

1931 ANTOINETTE ⸗ DETROIT

You'll get it with

PENNZOIL

"THE BEST MOTOR OIL IN THE WORLD"

Wherever it's essential to keep planes running on schedule time—or at sustained high speeds—you'll find Pennzoil considered a prime necessity. It's the official oil of America's great passenger lines—such as T. A. T., Western Air Express and Mason-Dixon Lines. It was used by Lindbergh in his recent record-breaking transcontinental hop.

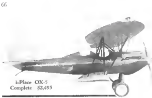
Why? Because Pennzoil keeps *all* parts of the engine lubricated *all* the time. Pennzoil minimizes internal friction — the cause of lessened horsepower. It has the penetrating power to reach every pinpoint of working surface. It has the stamina to *stay*. Pennzoil gives perfect lubrication at extreme temperatures under which ordinary oils evaporate. Your motor will develop more horsepower and greater speed when you lubricate it with Pennzoil.

Pennzoil is produced by lubrication specialists of nearly fifty years' standing who have at their command the facilities of the largest organization in the world operating exclusively on pure Pennsylvania crude. It is refined by a special process which uses only the *heart* of that crude—the fraction richest in lubricating efficiency. And Pennzoil lasts twice as long as ordinary oils—therefore, it's the most economical you can buy.

With every filling of Pennzoil you'll get at least 1500 *extra* miles of flying. In other words, you'll have *half a continent of extra mileage* before you have to drain and re-fill. And you can promise yourself this: They'll be the smoothest, sweetest, *fastest* miles you've ever flown!

THE PENNZOIL COMPANY
Executive Offices and Refinery: Oil City, Pa.
Division Offices: New York, Chicago, Los Angeles

PENNZOIL
HIGHEST QUALITY PENNSYLVANIA OIL



3-Place OX-5
Complete $2,495

CHOSEN...

By Those Who Know

BRUNNER-WINKLE

Bird Biplanes

Are built on scientific principles by an organization of skilled specialists to insure the maximum in safety, stability and durability.

The quick take-off and low landing speed make these handsome modern biplanes ideal for commercial and private pleasure flying.

The moderate price affords exceptional value.

ISSOUDUN FLYING SERVICE CORPORATION
HUDSON OHIO

AUGUST 14, 19[illegible]

BIRD AIRCRAFT CORPORATION
1-17 HAVERKAMP STREET
BROOKLYN, NEW YORK

GENTLEMEN -

We have just completed our second six month period of operation at ISSOUDUN and in as much as we have used the BIRD planes exclusively for student training we think that our record during this period may be of interest to you.

We are naturally quite proud of what we have accomplished and feel that our Kinner-powered BIRDS have been largely responsible for our success. It is our firm belief that this is the finest airplane on the market for training purposes and the average private pilot. It is as near fool-proof in the air as an airplane can be.

Of a total of 95 students who have been flying our BIRD planes, 41 have soloed here, 19 are still on dual, 35 are taking solo time. We have had 11 girls and have never failed to solo a student. Our oldest student is 63 years of age and he has now about 50 Hrs in his log book. The dual training required by these students has ranged from 1 Hr 30 Min to 10 Hrs 35 Min. Our girls average 8 Hrs 22 Min, the lowest being 6 Hrs 55 Min, and the highest 10 Hrs 35 Min. Our solo average for all students has been 5 Hrs. 1 Min.

The cost of operation and maintaining these planes has been unusually low. We are profitably charging $15.00 an hour for solo time. Entire freedom from crack-up is the reason. One of our planes now has had over 700 hours and is working perfectly every day.

As stated above we feel that no small part of the credit for this splendid showing belongs to your organization for designing and building an airplane which so perfectly meets the strenuous requirements of the school operator.

We wish to thank you for the whole-hearted co-operation you have always given us and with kindest regards, we are

Yours very truly,

D. Barr Peat

D. Barr Peat V Pres

DBP/F

DEALERS

We have an attractive sales proposition to offer—backed by complete factory co-operation

Write for full particulars

"ASK THE PILOT WHO FLIES ONE"

3 Place Kinner-Bird—$3,895

BRUNNER-WINKLE AIRCRAFT CORP.

1-17 Haverkamp Street
Glendale, Long Island, New York

Are You Compressed Air-Minded?

While the public is becoming "air-minded," Airport operators and Airplane manufacturers are rapidly becoming conscious of the tremendous value of compressed air *to them.*

At the Airports, compressed air is spraying paint and dope, cleaning engines, blowing out gas and oil lines, inflating tires, etc. Plane Manufacturers are using it to operate all kinds of pneumatic tools as well as for paint and dope spraying

Compressed air is so convenient, so flexible, so economical!

Model W

Water cooled. Four sizes, from 4 x 3½ to 5¼ x 5—Duplex Displacements from 15 to 128 cu ft.

Model G-18

Two-stage, fully automatic Displacement, 3¼ cu ft. with ¾ H.P. motor, 4¾ cu ft. with 1 H.P. motor, 6 cu ft. with 1½ H.P. motor. Tank, 20 x 48, 65 gals.

Quincy Compressors

are the very utmost in compressor value today. They represent the best engineering brains in this industry—and the "factory ideals" measure right up to the engineering

Quincy Compressors are economical to operate; economical to maintain; and they deliver all the air and all the pressure their specifications call for.

Furthermore, every Quincy Salesman is *factory trained*—thoroughly capable of recommending the right compressor for your needs and of servicing it after installation.

Get all the facts about Quincy Compressors. Write or use the coupon

Model A

Air cooled. Six sizes, from 1½ x 1½ to 4½ x 5. Displacements from 1, to 27 cu ft. Tight and loose or V type pulleys if desired.

Quincy Compressor Co.
208 Maine St., Quincy, Ill.

Please send complete information about Quincy Compressors for use as follows:

Firm Name
Address
City
State

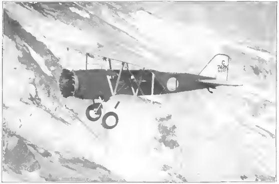
QUINCY Compressors

208 Maine St., Quincy, Ill.

Service and Sales

Atlanta Ga Birmingham Ala Boston Mass	Chicago Ill Cincinnati Ohio Cleveland Ohio	Davenport, Ia. Detroit, Mich.	Kansas City Mo Memphis, Tenn	Newark N J New Orleans La	St. Louis Mo Waco Texas Washington D C

Also in other Important Centers



BOEING 40-B4 HORNET-POWERED MAIL FOUR PASSENGER PLANE

2100
Flying hours
. . . . . without a major overhaul!

MORE than the full span of life of many planes! A Boeing "40" set this record—still structurally sound, and without symptoms of old age. Several "40s" placed on the transcontinental mail-passenger line three years ago are still "going strong" after 3000 hours of service.

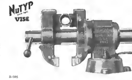
Stamina of Boeing planes means economy as well as dependability. The real cost of an airplane is the cost per hour of its flying life.

BOEING
AIRPLANE COMPANY
SEATTLE, WASH.

A Division of United Aircraft and Transport Corporation

In Canada: Boeing Aircraft of Canada, Ltd., Vancouver, B. C.

40-B4s are ready for September delivery



PIPE JAWS UP

With a turn of the jaws the Nutyp can be a machinist or pipe vise. The view shows the pipe vise in use. Ask your dealer or write us for complete information.

OSWEGO TOOL CO.
OSWEGO, N. Y.

B-595

WHITTELSEY

AMPHIB—a 3 or 4 place, open cockpit, pusher type Amphibion flying boat powered by a 165 h.p. motor.
Extensive tests have proved its aero—and hydrodynamic soundness.
The Whittelsey *Amphib* is remarkably stable in the air, and as comfortable as a duck on the water.

AVIAN—for the student, commuter and those who prefer to sport over dry land. One of the most famous planes in the history of aviation.
Whittelsey *Avian* combines dependability with economy—every gallon of gas is good for 20 miles of flying.
Write for specifications.

DEALERS: Inquire about the valuable franchise covering the Whittelsey *Amphib* and *Avian*.

THE WHITTELSEY MANUFACTURING CO., 220 Howard Ave., Bridgeport, Conn.

JAEGER

Chronograph
8 Day Clock

8 Day Aviation Clock
11 Jewels

8 Day Time-of-Flight
Clock

Jaeger timepieces are the last word in scientific equipment for airplanes.

Chronograph — 8 day clock — Extensively used for checking speed, climb etc., in fifths of a second and time required for a given run.

8 Day Time-of-Flight Clock — An instrument for determining elapsed time without calculating.

8 Day Clock
11 Jewels

8 Day Clock—An accurate and reliable 11 jeweled timepiece. Compensated for heat and cold which is extremely necessary in airplane use.

8 Day Aviation Clock —11 jewels. Equipped with the standard Army-Navy bezel and with a pair of red auxiliary hands which can be set to time of departure or to anticipated time of arrival for calculation of elapsed time.

Write for information.

JAEGER WATCH COMPANY
E. L. VAIL Vice Pres.
304 East 45th St., New York City
LONDON GENEVA PARIS

AERONAUTICAL TIME PIECES

The Budd Wheel Company

Makers of Wheels for airplanes

PHILADELPHIA AND DETROIT

Central Airport's new Terminal Building houses administrative departments, ticket offices, waiting rooms, U. S. Weather Bureau, Post Office, Department of Commerce 2nd Inspection District dormitories, and offices of Eastern Air Transport, the New York Philadelphia, Washington Airways Corporation and other organizations

Come to Central Airport

The most accessible metropolitan aviation center in the world, and one of the busiest! Business "depression" never landed here. Instead, there has been steady increase in sales, service and manufacturing activities, in student training, in sightseeing and charter flying, and in transport operation.

Here are roomy fire-proof hangars with modern shops. Complete lighting for night flying. Teletype and radio weather service. Restaurants. Swimming pools and other recreational facilities. Unlimited parking space.

Central Airport is only 15 minutes by car or bus from City Hall, Philadelphia. The Philadelphia-Camden area is a prolific source of skilled labor and materials essential to the aviation industry. Plenty of fine level land adjacent to the broad flying field can still be bought or leased on most attractive terms. For particulars, write Central Airport, Inc., Camden, N. J.

PHILADELPHIA-CAMDEN CENTRAL AIRPORT

Jacobs Aircraft Engine Co. is now producing economically priced 7-cylinder air-cooled radials. Also perfecting a 2-cylinder, 2-cycle glider engine which has been impressive in test flights.

WHERE TO FLY

Professional Services

AIRCRAFT SERVICE DIRECTORY

SEARCHLIGHT SECTION

Additional For Sale Ads.
Continued on pages 86 and 87

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD
Positions Wanted 10 cents a word, minimum $2.00 an insertion, payable in advance
Positions Vacant and all other classifications including equipment, 10 cents a word, minimum charge $3.00 an insertion
Proposals 40 cents a line an insertion

INFORMATION
Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH
1 inch $6.00
2 inches 5.75 an inch
4 inches 5.50 an inch
Other spaces and contract rates on request
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page

COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL THE 15th FOR ISSUE OF FOLLOWING MONTH — Aviation

FOR SALE

(Continued from preceding page)

FOR SALE Completely rebuilt OX-5 and OX-6 motors ready to install, together with a complete line of parts such as cylinders, crank cases, crank shafts, pistons, etc. Hisso parts. Also new N.A.C.A. Cowlings and wheel fairings of all sizes kept in stock at all times. Write or wire for special prices. Hill Aircraft Stream liners Company, 816 Reedy St., Cincinnati, Ohio.

FOR SALE OX Canuck, good flying condition, always in hangar. Accept car trade or highest cash offer. Free instruction. Charles Bicknell, Y.M.C.A., Moline, Illinois.

FOR SALE Johnson wax plane J-5 straight wing Waco, new last December, unusual amount extra equipment, electric starter, special Pioneer instrument board with rate of climb and bank and turn indicator, etc. New type landing gear. Original cost of ship $8,800. Ship now in ideal show job condition, completely finished with Johnson's wax, engine 30 hours since last overhaul, $800 worth of new J-5 parts. Real buy for somebody at $4,750 as company purchasing larger ship. Address all inquiries to Ed Hodges, Sturtevant, Wisconsin.

FOR SALE Buhl 4-place sport airsedan, Wright J-6 motor in excellent condition. Equipped with electric starter, lights, bank and turn indicator and full set of instruments. Will consider late model smaller ship in trade if in good condition. J. F. Dexter, Love Field, Dallas, Texas.

FOR SALE Brand new Detroit Sea Gull glider equipped with pontoons at factory, less than six weeks old, takes off at 20 m.p.h. behind motor boat. Price new at factory $1,000. Will sell for $600, Pontiac, Mich. Great chance for club. Write FS-6, Aviation, 520 No. Michigan Ave., Chicago, Ill.

BELLANCA
USED PLANE DEPARTMENT

We have for sale the following used planes which have been accepted or are offered in trade on new Bellanca "PACEMAKERS"

Name and Model	*Capacity*	*Engine*	*Approx. Hours*	*Location*	*Price*
Waco Taper Wing	3 Place	Wright J-5	250	Chicago	$5000.00
Cessna BW5	4 Place	Wright J-5	250	New Castle, Del	3500.00
Sikorsky	10 Place	2 PW Wasps	350	New York	25,000.00
Stinson	6 Place	Wright J-5	300	Illinois	5500.00
Bellanca CH	7 Place	Wright J-5	172	New Castle, Del	6600.00
Bellanca CH	7 Place	Wright J-5	New	New Castle, Del	on application

ALL IN GOOD CONDITION

ALSO SEVERAL NEW AND USED WRIGHT J-5 ENGINES

WIRE OR WRITE

BELLANCA AIRCRAFT CORPORATION
NEW CASTLE, DEL

FOR SALE
FAIRCHILD
Wasp powered C-? plane, condition very good. Will consider J-5 Waco, Travelair or Stearman 3 place biplane in trade or will finance for responsible buyer.
NORTHERN AIRCRAFT CORPORATION
Bay City, Mich

FORD TRI-MOTORED PLANE
12 Passenger
For Immediate Sale
Latest type cabin interior, excellent condition — looks like new. Plane and motors recently overhauled. Bargain for Cash $22,500.00
FS-4, Aviation
Tenth Ave. at 36th St., New York City

FOR SALE
2—Hisso Airplanes
1—Fay and Egan Rip-saw and Re-saw, complete
3-Spindle Drill Press.
ORIN WELCH AIRCRAFT COMPANY
Anderson, Indiana

American Eagle For Sale
License NC 3915
First Class Condition. Best offer accepted. Will consider car as part payment. Address at once to
M. D. S.
3004 Emmaus Ave., Zion, Ill.

CARTRIDGE CORE
RADIATORS
for OX-5 Motors
Complete with hangers, shutter flanges, water boxes on end of core, length over all 27 inches
$29.75 Each.
Write for quantity prices
Faber Schneider Radiator Co.
2317 16 So. Wabash Ave., Chicago, Ill.

FOR SALE
OX-5 CURTISS ROBIN
Scintilla Mag. Booster, always in hangar, 150 hours, perfect condition, privately owned. Priced right to sell.
Dr. I. H. DUNHAM
Adams Bldg., Danville, Ill.

FOR SALE
TRAVEL AIR
6 place cabin Monoplane Type 6000B with J6-300 motor, also real radio. Has had but 75 hours. Price $10,500. You save over $4,000.
WARD S. LENT, Poughkeepsie, N. Y.

Airplane Engines — *For Sale*
11—Curtiss OX5's 2—Curtiss OXX6's
10—Hisso Model A's 5—Hisso Model E's
Rebuilt, Block Tested and Run In. Send For Description and Prices.
Curtiss OX5 and Hisso Parts
Authorized Kinner Parts and Service.
BECKMAN MACHINE WORKS, INC.
4610 W. Lake St., Chicago, Illinois

Wasp and Hornet Engines
We offer for sale a limited number of used Wasp and Hornet engines at substantial price reductions.
The United Airports of Connecticut, Inc.
Hartford, Connecticut

Representatives Wanted!

Our client, America's leading flying school, desires additional representatives to contact prospective students in the larger cities and educational centers. Part or full time work on liberal commission basis. Qualifications: Age between 25 and 40 years, outstanding character, aviation experience preferred. Write full details education, business experience. Name three references. . . . The H. K. McCann Co., 649 Skinner Building, Seattle, Wash.

The Searchlight Advertising in This Paper

is read by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good second-hand piece of apparatus at a moderate price or an expert employee

The Best Proof

of this is the variety of this journal's Searchlight ads. Without a constant and appreciable *demand* for such machinery or services by its readers, the market place which these advertisements represent could not exist for any length of time.

Are you using the
Searchlight Section?

AVIATION SCHOOL

We will lease to responsible parties storage space and class rooms in new $84,000.00 hangar, and give exclusive rights for student training. Also shop and repair. No school in this city. Average twenty foreign ships per day. A very attractive proposition awaits right party. Address Manager,

Transcontinental Airport
Toledo, Ohio

Do Your Selling Right on New York's Greatest Airport

There is no place like an active airport for selling planes and airplane equipment. For the New York area, Roosevelt Field is ideal. It is in the center of wealthy Long Island, convenient to New York City, completely equipped for every kind of work.

A few hangars are still available right on the field at exceptionally low prices. Long or short term leases. Manufacturer's facilities.

Complete details sent on request

ROOSEVELT FIELD
Mineola, L. I., N. Y.

FOR SALE

FOR SALE Pitcairn drawing first-class flying condition, OX motor overhauled, new prop, large wheels. Fly away $900. Airplane Sales & Service Company, Port Newark, N. J.

FOR SALE OXX-6 Travel Air biplane. Motor had 10 hours since overhauled, 2 Beech magnetos, complete Miller valve action, dual controls, headstreamline, large wheels, ship and motor as perfect as new. Will accept light car on trade. Cash price $1,375. Wire N. F. King, Garnett, Kansas.

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STEARMAN C3B N.C. license, powered with Wright J-5, compass, altimeter, airspeed and photographic well in forward cockpit, flare brackets, turn and bank indicator rear cockpit, ship equipped with storage battery, landing and navigation lights and dual controls. Has been privately owned, not never cracked or or its back, ship and motor in excellent condition. $3,900 for quick sale, no trades. Louis C. Mark, 1775 Broadway, New York City. Circle 5723.

TRANSPORT pilot, Class A-1 rating, experience cross-country and instruction work, 250 hours, open ships. Age 20. Will go anywhere. Reference. Write Herbert Rish, Kenton, Ohio.

WACO 10 OX-5 licensed ship and motor in excellent condition. Nitrated, never cracked. Always kept in hangar. $1,250. M. F. Deveraux, 3288 Mott Ave., Far Rockaway, N. Y. Phone 3333.

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TRANSPORT pilot—Army trained, desires permanent connection, 1,000 hrs. varied experience on several types. Single. Good references. PW-5, Aviation, Tenth Ave. at 36th Street, New York.

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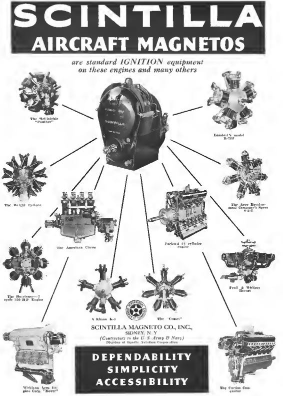

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